A BIOLOGICAL SURVEY OF BAHÍA DE LOS ANGELES, GULF OF CALIFORNIA, MEXICO. IV. BENTHIC AMPHIPODA (CRUSTACEA).

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Abstract. — The gammaridean fauna of a bay in the disjunct, warm-temperate zone of the Gulf of California is discussed. Of the 70 species encountered, 13 represent new species and 5 new subspecies. Two new genera are proposed. In 1962 and 1963 a sharp decline in diversity and abundance occurred in autumn in depths between 6 and 46 m. The diversity of Gammaridea is about half that of similar depths in southern California. Approximately 70 per cent of the amphipods have warm-temperate affinities; at least 9 cognates of Californian species occur in BLA. Shallow, sandy bottoms, in 2-8 m depth, are dominated by *Ericthonius brasiliensis* and *Podocerus fulanus;* mid-depths of 7-36 m on fine sands by *Ampelisca compressa, A. cristata* and *Platyischnopus metagracilis;* and the deepest zone, 37-46 m on brown silts, by *Heterophoxus oculatus, Ampelisca cristata* and *A. compressa.* None of the dominant species is endemic, but in the Californian warm-temperate zone *Podocerus fulanus* is confined to lagoons.

Resumen.— Se estudian los Anfípodos Gammáridos de una bahía situada en la zona limítrofe de la región cálido-templada del Golfo de California. Se describen setenta especies, de las cuales 13 son especies nuevas y además 5 nuevas subespecies. La bahía está bajo la influencia del conocida fenómeno del efecto del verano en la densidad faunística, de modo que ésta es pobre en relación con la que presenta el mar abierto. Un 70% de los Anfípodos, aproximadamente, presentan afinidades con los de las regiones cálido-templadas; por lo menos 9 especies son cognatos a las que aparecen en regiones cálido-templadas; todo lo cual indica en cierto modo, el aislamiento de esta fauna de sus fuentes originales.

Las regiones poco profundas (de 2 a 8 metros de profundidad) con fondos arenosos, están dominadas por *Ericthonius brasiliensis* y *Podocerus fulanus;* las zonas de profundidad media (de 7 a 36 m) sobre arena fina, aparecen pobladas por *Ampelisca cristata, A. compressa y Platyischnopus metagracilis;* mientras que las zonas profundas (de 36 a 46 m) con fondos de fango marrón, están habitadas por *Heterophoxus oculatus, Ampelisca cristata y A. compressa.* Ninguna de las especies dominantes refleja una dislocación de la fauna al hacerse endémicas; a excepción de *Podocerus fulanus* que puede funcionar en mar abierto como una reliquia confinada a las pequeñas lagunas litorales.

This paper describes the gammaridean fauna of a small bay, Bahía de los Angeles, on the east shore of Baja California, in the northwestern part of the Gulf of California. Amphipoda from the gulf have been recorded previously by Shoemaker (1925). Bahía de los Angeles is presumably within the disjunct, warm-temperate, upper gulf region discussed by Beltran (1960) in the "Symposium: The biogeography of Baja California and Adjacent Seas." Collection of this fauna was undertaken as part of a survey to assess the simple mud and sand-bottom communities and the general environment of that bay. Barnard and Grady (1968) have outlined the thermal regime, water characteristics, and benthic sedimentary structure of the bay and have reported on the phenomenon of "summer-kill" as a dominating influence on the warm-temperate fauna in 1962 and 1963.

The amphipodan fauna of Bahía de los Angeles is impoverished, in terms of both species and abundance of individuals, in comparison with southern California, the only other quantatively studied region of the eastern Pacific Ocean.

Approximately 70 per cent of the Amphipoda have warm-temperate affinities, and at least 9 cognates of warm-temperate species occur in Bahía de los Angeles (BLA).

The fauna lacks numerous species that overlap this latitude in the open part of the Pacific Ocean. The diversity of Amphipoda is appproximately half that of similar depths in southern California.

The fauna, which is seriously depleted during high temperatures of late summer (25 C), may also be affected by redtide (Barnard and Grady, 1968). Repopulation of the bay during winter thermal minima (ca. 15 C) apparently occurs rapidly from depths exceeding 50 m; post-winter samples contain a dense fauna of polychaetes, Amphipoda, and small mollusks, especially clams. Windrows of dead clam shells, in adult stages, occur on sand beaches in the southwestern part of the bay. These suggest that mass mortalities in summer occur sporadically rather than annually.

The Amphipod Fauna

Seventy species of gammaridean Amphipoda, including 2 new genera, 13 new species and 5 new subspecies, have been identified from Bahía de los Angeles. Nearly 20 additional species are recorded in fragmented and juvenile materials (Table 1). Twenty-seven of the 70 identified species dwell primarily on soft bottoms, 33 inhabit hard bottoms and 10 occur in both habitats.

In April, 1962, Amphipoda, as well as Mollusca, Polychaeta, and small Decapoda were conspicuous in the samples. During the resurvey in October-November 1963 the entire fauna was so poorly represented in the first few samples that we believed the orange-peel grab was malfunctioning. Numerous adjustments were made; control samples taken with a Van-Veen grab confirmed the sparseness of the benthic fauna.

The diversity of soft-bottom (infaunal) species in Bahía de los Angeles is far less than on the coastal shelf of southern California even though the diversity of sediments is similar. In depths of 2-55 m in southern California 136 (infaunal) species have been recorded (see Table 9 of Barnard, 1966, subtracting 29 deep-water species from the total of 165). Nevertheless, the abundance of individuals (2000 per s.q m*) in April at Bahía de los Angeles equals or slightly exceeds that found at various depths in southern California, but it is very low compared with parts of Bahía de San Quintín (J. L. Barnard, 1964b) where certain biotopes have more than 20,000 individuals /m^2. In Bahía de los Angeles the greatest abundance (4569 individuals /m^2) occurs in depths of 2-6 m, whereas in depths between 7 and 46 m the abundance drops to between 75 and 208 individuals /m^2 (Table 2).

A sharp decline in abundance of all but three of 20 dominant soft-bottom gammarideans occurred between April 1962 and November 1963 (Table 1, species marked with "S" and having 10+ specimens in April samples). The decline in frequency is generally of one order of magnitude but no appreciable decline occurred in *Rudilemboides stenopropodus* and a slight to moderate decline occurred in *Heterophoxus oculatus* and *Microdeutopus schmitti*. Six species were completely absent from samples in November, 1963. Whether an autumnal decline (1962) and winter refurbishment (1963) occurred are unknown. Four of the six species missing in November are eurybathic (Barnard, 1966) and presumably could repopulate shallow water depths from deep water sources. Autumnal impoverishment occurred in depths of 40-46 m as strongly as it did in depths of 21-30 m as seen in the following tabulation in which 19 samples were selected from each depth in each season, indicating total specimens of Gammaridea collected in each category.

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* computed from 8775 individuals occurring in 70 samples representing about 4.38 m^2; see Table 1 for April samples. The orange-peel grab collects an area of about 0.06 m^2.

TABLE 1

ALPHABETICAL LIST OF GAMMARIDEA OCCURRING IN BAHIA DE LOS ANGELES.

ASTERISKS SIGNIFY SPECIES WITH COGNATES IN WARM-TEMPERATE OF SOUTHERN CALIFORNIA. AFFINITIES AND DISTRIBUTION ARE SUMMARIZED BY THE LETTERS E, EURYLATITUDINAL; T, TROPICAL; WT, WARM-TEMPERATE; U, UNKNOWN. THE LETTER S IN COLUMN 2 REFERS TO THOSE SPECIES CONSIDERED TO BE CONFINED TO SOFT-BOTTOMS.

	SOFT BOTTOMS					HARD BOTTOMS		
		April, 1962		October, 1963		Intertidal & Scuba		
	Affinity or Distribution	*Samples* (70)	*Specimens*	*Samples* (91)	*Specimens*	*Inshore dredges* +=*present* #=*abundant*	*Samples*	*Specimens*
**Acuminodeutopus periculosus*	WT	6S	72	6	19		1	3
Ampelisca compressa	E	49S	607	19	40		1	1
Ampelisca cristata	E	68S	2014	47	191		1	1
Ampelisca lobata	E						2	6
Ampelisca mexicana	T	12S	16	1	1			
Ampelisca milleri	E						1	1
Ampelisca schellenbergi	T						1	2
Amphideutopus oculatus	WT	12S	34			+	1	2
Amphilochus neapolitanus	E						1	9
Ampithoe plumulosa	E						1	38
Ampithoe pollex	E						8	591
Ampithoe ramondi	T						3	14
Ampithoe tea	WT	1	3				4	20
Argissa hamatipes	E						1	1
Batea rectangulata	T	13S	87	5	22	+	2	9
Batea susurrator	T	4S	506			+		
**Batea transversa coyoa*	T	1S	10	1	4	+	2	4
Carinobatea conductor	T						1	9
Corophium baconi	E	2S	33			++	4	75
Corophium uenoi	WT						2	136
Elasmopus rapax	E						12	572
Ericthonius brasiliensis	E	14S	2870	3	7	++	11	451
Eurystheus thompsoni	T						1	8

TABLE 1 (cont.)

		SOFT BOTTOMS April, 1962		SOFT BOTTOMS October, 1963		HARD BOTTOMS Intertidal & Scuba		
	Affinity or Distribution	*Samples* (70)	*Specimens*	*Samples* (91)	*Specimens*	*Inshore dredges* +=*present* #=*abundant*	*Samples*	*Specimens*
**Eurystheus tonichi*	WT	2	3			++	2	9
**Garosyrrhoe disjuncta*	WT	1	1			+	2	19
Gitanopsis pusilloides	T	2	2	1	2	++	2	100+
Heterophlias seclusus escabrosa	T						1	1
Heterophoxus oculatus	E	22S	287	30	133		1	1
Hippomedon ?propinquus	WT	2S	2	1	1			
Hyale rubra frequens	WT	1	10				7	205
Jassa falcata	E			2	2			
Lembos macromanus	T	1	1			+	4	20+
Leucothoe alata	WT						1	8
**Liljeborgia marcinabrio*	WT	1S	1					
**Listriella melanica lazaris*	WT	38S	141	13	19	+	1	1
Lysianassa dissimilis	E						1	1
Lysianassa macromerus	WT						1	1
Maera inaequipes	T						3	15
**Megaluropus longimerus falciformis*	WT						1	14
Megaluropus risendus	T	2	2	1	2			
Melita sulca	WT					+	3	8
Meximaera diffidentia	T						2	4
Microdeutopus schmitti	WT	15S	95	7	65	++	7	119
Microjassa macrocoxa	T	5	41			++	2	112
Monoculodes hartmanae	WT	38S	162	10	14		2	4
Neomegamphopus roosevelti	T						3	13
Orchomene magdalenensis	WT	3S	6	2	2		1	1
Pachynus barnardi	WT	4S	4					
Paraphoxus cognatus	WT	S		2	2			
Paraphoxus epistomus	E	S		1	5			
**Paraphoxus gemmatus*	WT	1S	1	1	4	+	1	2
Paraphoxus spinosus	E						4	9

Paraphoxus tridentatus	WT	S		2	9			
Parapleustes commensalis	U						1	1
Photis bifurcata	WT	4S	5					
Photis brevipes	WT	4S	163			++	1	7
Photis californica	WT	7S	55					
Platyischnopus metagracilis	T	64S	563	39	105			
Platyischnopus viscana	T	S					1	3
Podocerus brasiliensis	T						5	60
Podocerus fulanus	WT	5S	860			++	7	315
Polycheria osborni	E						1	43
**Pontogeneia nasa*	WT						4	333
Rhachotropis luculenta	WT	4S	4					
Rildardanus tros	U					5		
Rudilemboides stenopropodus	WT	8S	75	6	77	+	3	75
Synchelidium sp. G	WT	3S	5					
Synchelidium rectipalmum	E	1S	2				2	15
Uristes entalladurus	WT	1S	1					
**Westwoodilla cornuta*	WT	14S	20	3	3			
Unidentified Species								
Acanthonotozomatid		1	1					
Amphithoe sp. juveniles							4	25
Batea sp.		1	3					
Carinobatea sp.							1	1
Isaeid (aorid facies)		1	1					
Isaeid (probable new genus)		1	4					
Isaeid							1	3
Lembos sp. (cf. *audbettius* Barnard, 1962a)							3	4
Lysianassid		1	1					
Macra sp. (cf. *simile* Stout)							1	1
Oediceroid							1	3
Photis spp., juveniles		12	36					
Pleustes sp.							1	1
Stenothoid A							2	6
Stenothoid B							2	6
Talitrid						1		
Unknown Family		1	1					

TABLE 2

DOMINANT AMPHIPODA TAKEN IN SEVERAL DEPTH CLASSES DURING APRIL, 1962, SURVEY OF MUD BOTTOMS IN BAHIA DE LOS ANGELES, INDICATING NUMBER OF INDIVIDUALS PER SQUARE METER.

	Depth class, m				
	2-6	7-16	17-26	27-36	37-46
No. samples	3	13	17	24	13
No. dominant species, total	11	6	6	6	5
Species, total	15	14	20	22	18
Individuals/m^2, total	4569	75	208	109	173
Acuminodeutopus periculosus	106				
Ampelisca compressa		5	7	7	17
Ampelisca cristata		14	36	28	21
Batea rectangulata	32	5			
Batea susurrator			28		
Corophium baconi	58				
Ericthonius brasiliensis	2500				
Gitanopsis pusilloides	21				
Heterophoxus oculatus				1	22
Listriella melanica lazaris	111				
Microdeutopus schmitti	100				
Microjassa macrocoxa	53				
Monoculodes hartmanae		5	3	1	
Orchomene magdalenensis	53				
Photis brevipes		4		3	
Photis californica					4
Platyischnopus metagracilis		4	8	8	7
Podocerus fulanus	1390		4		
Rudilemboides stenopropodus	106				

Depth	April, 1962	November, 1963
21-30 m	855	97
40-46 m	1104	128

Six species of Amphipoda dominate the benthos of BLA: *Ericthonius brasiliensis, Podocerus fulanus, Ampelisca cristata, Platyischnopus metagracilis, Ampelisca compressa, and Heterophoxus oculatus.*

The shallow sandy bottoms from about 2 to 8 m are dominated by *Ericthonius brasiliensis* and *Podocerus fulanus* (Table 2). These species are tube-dwellers; presumably they attach to hard particles and in patches of red algae occurring on those bottoms. Seven other species occurring in these depths (Table 2) are more abundant than any species found in depths greater than 6 m. This density pattern differs from that found off the coast of southern California, where Amphipoda are relatively sparse on inshore sand bottoms but are abundant in depths exceeding 6 m (Barnard, 1963).

The 6 m depth-class in BLA and the 9 m depth-class in southern California are quite different (Tables 2, 3; *cf.* Barnard, 1963: Table 16) In southern California, *Ericthonius brasiliensis* is 29th in abundance. Its primary position in BLA may reflect: 1) the more abundant algae in the quieter waters that act to shelter masses of tubes from disruption by surf action; and 2) the absence of competitors resulting from extreme eurythermic conditions. *Ericthonius brasiliensis* is a eurythermic species that is cosmopolitan in tropical, warm-temperate, and even in some cold-temperate areas *(viz.* Norway; Puget Sound, Washington). Whereas *Ericthonius brasiliensis* is able to adjust

to wide seasonal extremes in temperature, *Podocerus cristatus* of the open Pacific may not endure short-term fluctuations even though it adjusts to wide extremes in increments by latitude. This possibility is suggested by the dominance of *Podocerus fulanus* in Bahía de los Angeles and in lagoons of southern California wherein *P. cristatus* is absent.

In the 16 m depth-class, the frequency of Amphipoda is lowest (75 m^2). This corresponds to southern California where standing-crop and density of organisms are lowest seaward of the surf zone but increase sharply on softer bottoms of deeper waters. The mid-depth zones, generally 7 to 36 m in BLA, are dominated by *Ampelisca cristata*. *Platyischnopus metagracilis* and *Ampelisca compressa* are also fairly common in the 26 and 36 m depth zones, but the only other species that can be considered dominant

TABLE 3

DOMINANT AMPHIPODA TAKEN IN SEVERAL DEPTH CLASSES BETWEEN 1957 AND 1961 ON COASTAL SHELF OF SOUTHERN CALIFORNIA, BASED ON 161 SAMPLES PROPORTIONALLY DIVIDED ACCORDING TO RESPECTIVE DEPTH CLASSES; COLLECTED BY "VELERO IV," UNIVERSITY OF SOUTHERN CALIFORNIA; INDICATING NUMBER OF INDIVIDUALS PER SQUARE METER. EACH COLUMN INCLUDES ONLY THE FIRST 20 DOMINANT SPECIES RANKED BY INDIVIDUALS PER SQUARE METER IN THAT DEPTH CLASS AND A SPECIES IS NOT NECESSARILY ABSENT FROM DEPTH CLASSES LACKING NUMBERS. A PHYLETIC OR ECOLOGIC EQUIVALENT OCCURRING IN BAHIA DE LOS ANGELES IS NOTED. + MARKS THOSE SPECIES ALSO OCCURRING IN BAHIA DE LOS ANGELES.

	Depth class, m			
Species	4-9	10-18	19-37	*Occurrence in BLA*
Acuminodeutopus heteruropus		47	9.1	*A. periculosus*
Amphideutopus oculatus		11	48	+
Ampelisca brevisimulata		22	64	*A. mexicana*
Ampelisca compressa	9.2	27	14	+
Ampelisca cristata	1.0	27	63	+
Ampelisca lobata		21		+
Ampithoe sp.	4.4			+
Aoroides columbiae	7.5	29	26	
Argissa hamatipes		12	8.9	+
Batea transversa	4.1	12		+
Eohaustorius washingtonianus	9.5			
Ericthonius brasiliensis	0.5	11		
Eurystheus thompsoni		21	9.0	*E. tonichi*
Heterophoxus oculatus			26	+
Ischyrocerus pelagops	3.0	12		*Microjassa macrocoxa*
Listriella goleta			37	*L. m. lazaris*
Mandibulophoxus uncirostratus	30			*Platyischnopus metagracilis*
Megaluropus longimerus	2.3			+
Monoculodes hartmanae	4.9			+
Paraphoxus abronius	9.7	95	10	*P. cognatus*
Paraphoxus bicuspidatus	25		11	
Paraphoxus epistomus	55	16	27	+
Paraphoxus fatigans		11	15	
Paraphoxus heterocuspidatus	3.8		7.3	*P. gemmatus*
Paraphoxus obtusidens		15	36	*P. spinosus*
Paraphoxus stenodes		40	19	
Paraphoxus variatus	4.1	20	7.7	
Photis brevipes		30	36	+
Photis lacia	25			*P. californica*
Synchelidium shoemakeri		17		*Synchelidium* spp.
Synchelidium spp.	31			*Synchelidium* spp.

is the nestler *Batea susurrator* at 26 m (Table 2). The species of *Ampelisca* are tube builders, but their soft tubes are anchored in the substrate and lie limply on the surface. Like all members of the Phoxocephalidae, *Platyischnopus* is presumed to be a burrower and in this capacity it represents a poor substitute for the dense populations of *Paraphoxus* (16 species) found off southern California. In depths exceeding 36 meters the species of *Ampelisca* and *Platyischnopus* maintain dominance but they are joined by another burrower, *Heterophoxus oculatus* (Table 2), a eurybathic organism, which is also prominent on coastal shelves of the open sea and on the coastal slope to depths of almost 2000 m. Note that *Platyischnopus* is scarcely more abundant than *Photis*, but it is more widespread and occurs in nearly every sample between 7 and 46 m, whereas *Photis* occurs abundantly in only a few.

The inshore sands of California in depths of 4-9 m are dominated by *Paraphoxus*, *Synchelidium*, *Mandibulophoxus* (a morphological parallel to the deeper-dwelling *Platyischnopus* of BLA), and *Eohaustorius;* the abundance of these burrowing forms, rather than of infaunal tube-dwelling species of *Ampelisca*, may reflect the strong water motion and shifting substrate of the region. However, tubicolous genera, such as *Photis*, that attach their tubes to structures projecting above sediment level, are as abundant as some of the species of burrowers. There is some weak evidence (Barnard, 1958b) that tubicolous species inhabiting hard particles are far less obligated to remain in their tubes than are the infaunal ampeliscids and can move from place to place as their epibenthic substrates are shifted. They appear to be able to occupy tubes of other organisms without necessarily constructing their own. Even though the sampling efforts (complemented by dredgings in BLA) have been comparable, the diversity of the shallow-water BLA fauna is half that of southern California (23 vs 46 species; Table 1 and Barnard, 1963, Table 16), which suggests that the quiet-water environment BLA is even harsher than the shifting substrate of open-sea shallows.

Of the medium-depth fauna, three of the six common species of BLA are also abundant in southern California: *Ampelisca cristata*, *A. compressa*, and *Photis brevipes*. The ecological counterparts in southern California of *Platyischnopus* and *Monoculodes*

TABLE 4
SUBSTRATE DISTRIBUTION OF 4 SPECIES OF GAMMARIDEA IN BLA

Species	*Substrate*	*Percent of Specimens*	*Average per Sample*	*Number per Positive Sample*
Ampelisca compressa	Silt	28	8.9	19.0
	Sandy silt	40	14.0	15.0
	Silty sand	23	7.3	12.0
	Sand	9	3.4	4.6
Ampelisca cristata	Silt	22	23.0	24.0
	Sandy silt	38	45.0	45.0
	Silty sand	27	29.0	34.0
	Sand	13	16.0	15.0
Listriella melanica lazaris	Silt	6	0.4	1.6
	Sandy silt	12	1.0	2.4
	Silty sand	20	1.4	2.1
	Sand	62	5.2	6.5
Platyischnopus metagracilis	Silt	28	8.5	8.5
	Sandy silt	29	10.0	10.0
	Silty sand	25	7.5	9.3
	Sand	18	6.7	8.2

are probably *Paraphoxus* and *Synchelidium* but the mainland coastal shelf of California has no obvious counterpart of *Batea*. *Batea* occurs abundantly only in the Channel Islands of California and joins *Platyischnopus* in a few square miles of benthos off San Diego. Two species of *Synchelidium* also occur in BLA but their occurrence is very sparse.

Of the deep-water fauna, four of the nine BLA species are also prevalent in southern California: *Ampelisca cristata*, *A. compressa*, *Photis brevipes*, and *Heterophoxus oculatus*.

Of the 27 most abundant species of southern California in depths similar to those sampled at BLA, only 6 species or their allopatric equivalents are absent from BLA; most of these are members of *Paraphoxus*. However, many other southern California species are also absent from BLA, especially notable being a host of ampeliscids (Table 9 of Barnard, 1966). Northern species having their southern limits in southern California should be omitted from consideration. This may be determined in Barnard (1966, Table 9).

The distributions of the 6 dominant species at BLA in April are presented in Figures 1-6.

Impoverishment of the Fauna

The gammaridean fauna on soft-bottoms in BLA is far less diverse than the fauna of the coastal shelf of southern California. The pertinent members (33) of the BLA fauna are marked in Table 1 and the 102 members of the southern California fauna have been extracted from Barnard (1966, Table 9) by eliminating deep-water species, rarely occurring members, and those known from the literature to inhabit hard bottoms primarily. Gammaridean genera for the most part inhabit either soft or hard bottoms but occasional genera such as *Ampelisca* and *Paraphoxus* have members in both habitats. These differences have been taken into account in the two faunas under consideration.

The soft-bottom Gammaridea of BLA represent 23 genera whereas the Gammaridea of warm-temperate California represent 58 genera.

The two most diverse benthic genera in midlatitudes are *Ampelisca* and *Paraphoxus*. In BLA *Ampelisca* has 3 species on soft bottoms but in southern California it has 8. In BLA *Paraphoxus* has 4 species on soft bottoms but in southern California it has 16.

Only 5 soft-bottom species of BLA (3 of *Batea* and 2 of *Platyischnopus*) have no counterparts in the dominant fauna of soft-bottoms of mainland southern California.

Seventy-four species of the California fauna have not been found on soft-bottoms of BLA, although 5 have been found sparsely on hard-bottoms. The remaining 69 species of southern California are not necessarily stenothermic as might be expected from their absence in BLA. Thirty-seven of those species have depth ranges (by arbitrary classes) from 18 to 183 m and 12 others have ranges between 18 and 55 m (Barnard, 1966, Table 9). They are therefore potentially eurythermic but their absence in BLA may reflect the inability of a deme to undergo wide thermal changes annually.

There are some striking omissions from the BLA fauna of eurylatitudinal and tropical species, for example: (1) *Paraphoxus floridanus*, a tropical pan-American species, with northern limits at the Mexico-California border; (2) *Paraphoxus obtusidens*, known from the Kurile Islands to Colombia, South America; (3) *Ampelisca venetiensis*, known from southern California to Ecuador; (4) *Ampelisca cristoides*, known from the open Gulf of California even as close as Angel de la Guarda Island; (5) *Ampelisca pacifica*, California to Panama, perhaps submerging deeply in tropical waters; (6) *Ampelisca brevisimulata*, from California to Panamá, in tropical depths of 9 m;

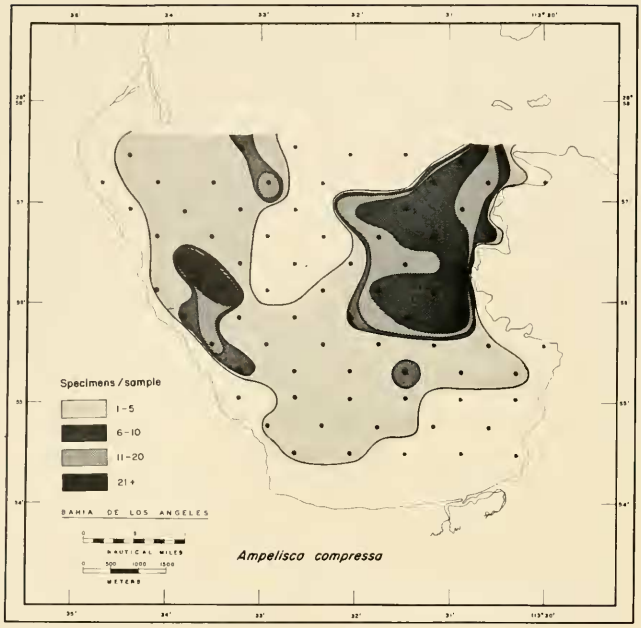

Figure 1. Distribution of *Ampelisca compressa* Holmes.

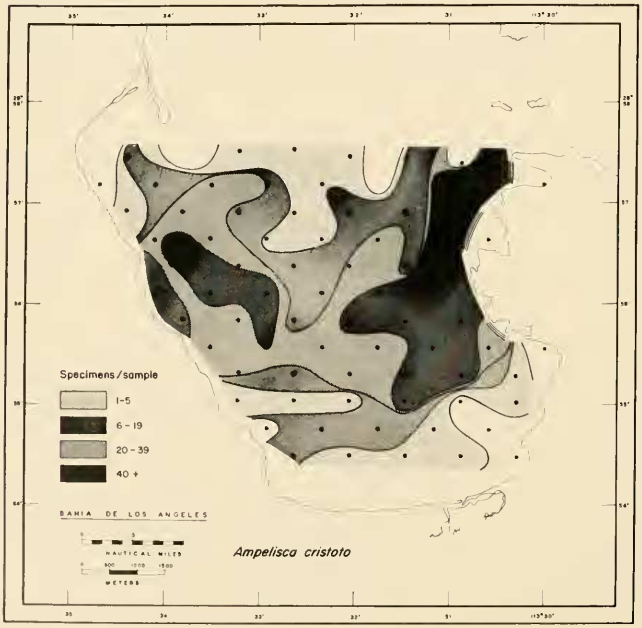

Figure 2. Distribution of *Ampelisca cristata* Holmes.

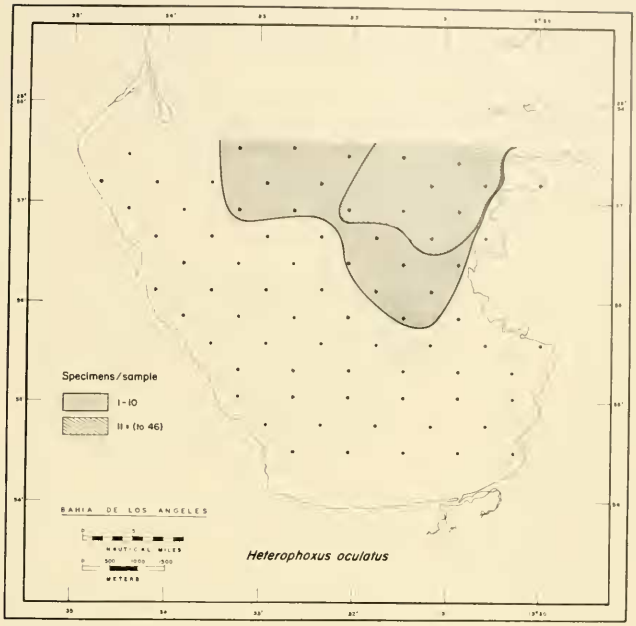

Figure 3. Distribution of *Heterophoxus oculatus* Holmes.

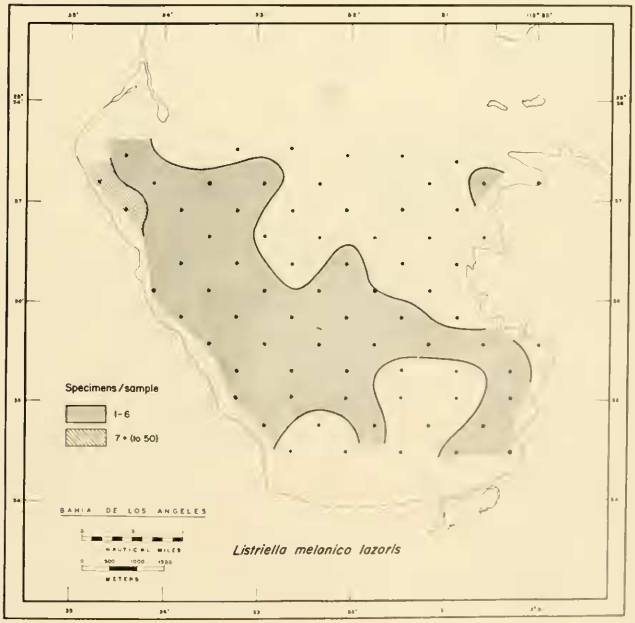

Figure 4. Distribution of *Listriella melanica lazaris* Barnard.

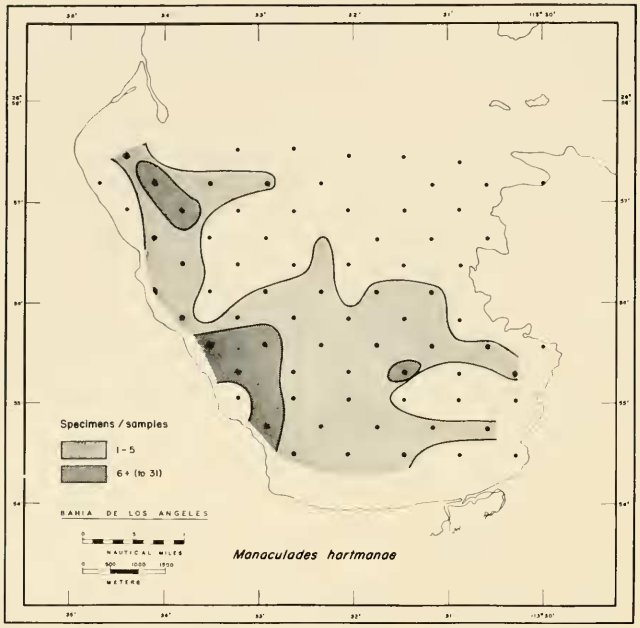

Figure 5. Distribution of *Monoculodes hartmanae* Barnard.

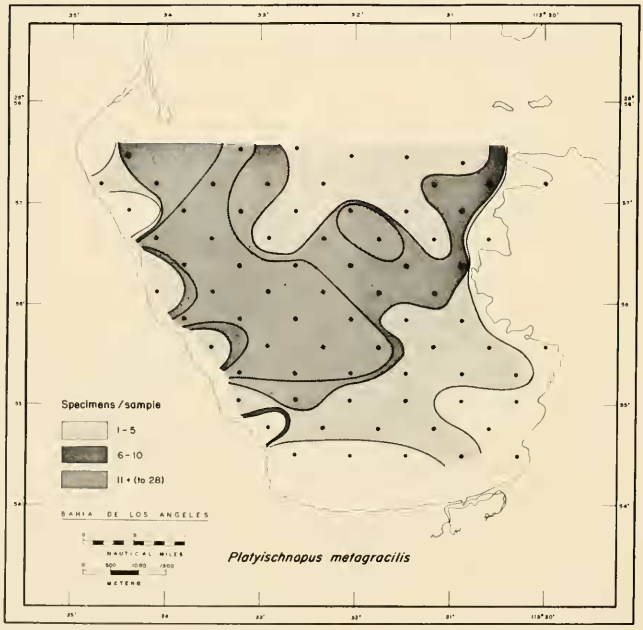

Figure 6. Distribution of *Platyischnopus metagracilis* Barnard.

(7) *Ampelisca hancocki,* collected by the "Velero III" near BLA in depths slightly exceeding those of this survey; (8) *Ampelisca indentata,* from California to Gulf of California; (9) *Ampelisca pugetica,* Washington to Angel de la Guarda Island, on shore at the latter; (10) *Byblis veleronis,* California to Gulf of California (Espiritu Santo Island, 38 m); (11) *Cerapus tubularis,* a eurylatitudinal cosmopolite; (12,13) *Cheiriphotis magacheles* and *Chevalia aviculae,* both tropical cosmopolites, occurring in southern California; (14) *Mandibuphoxus uncirostratus,* apparently a tropical Indo-Pacific species found as far north as southern California; (15) *Photis elephantis,* known from southern California and with records at hand from the Galapagos Islands. Other omissions from the BLA fauna include *Anamixis linsleyi, Batea lobata, Eurystheus spinosus, Leucothoides pacifica, Metaceradocus occidentalis, Metaphoxus frequens, M. fultoni, Parajassa angularis,* and *Pontogeneia minuta,* all but *Metaphoxus* spp. probably occur on hard bottoms, which have not been completely explored.

Affinities of the Fauna

Nine species and subspecies of BLA Gammaridea are cognates of forms with warm-temperate affinities; 20 species occur only in warm- and cold-temperate regions; 19 species occur in or have affinities with tropical waters; 2 species have unknown affinities; and the remaining 18 have eurylatitudinal distributions (Table 1). *Batea transversa coyoa* may also have direct warm-temperate affinities, although the genus *Batea* is mainly tropical in distribution. *Acuminodeutopus periculosus* is assumed to be a warm-temperate species, because to date the genus has been found only in warm-temperate regions. Of the unidentified species only *Pleustes* sp. has definite warm-temperate affinities. This is the southernmost record of the genus.

More than 70 per cent of the Gammaridea in BLA have non-tropical affinities, but if the eurylatitudinal species with unknown affinities are subtracted the percentage drops to 61 (30 of 49 species). Soule (1960) found that 57 per cent of the Bryozoa occurring in the northern third of the Gulf of California have non-tropical affinities. On the other hand, Garth (1960) found that only 8 per cent of the Brachyura have northern affinities, but his data included the entire Gulf.

Of the dominant Gammaridea with known affinities of soft-bottoms in BLA, 72 per cent (18/25) have affinities with warm regions; three species are tropical, 15 warm-temperate, and 7 eurylatitudinal.

Systematic Procedure

Classification follows that of Barnard (1958a). Distributional information excludes new records in BLA. Locality data occur in Barnard and Grady (1968). Materials are summarized in Table 1. For a complete Station list of specimens order NAPS Document 00308 from ASIS National Auxiliary Publications Service, c/o CCM Information Sciences, Inc., 22 West 34th Street, New York, N. Y., 10001; remitting $1.00 for each microfiche copy and $3.00 for each hard-copy reproduction. Samples 130 and 210, represented by aliquots, have their data expanded by factors of 100 and 10 respectively. Diverse substrate habitats of 4 species are summarized in Table 4. Sideheads of "Records" include summary of locality data, mainly depth; of "Relationships" include, with few exceptions, morphological differences from the nearest relative only, and occasional comments on classificatory problems arising from this study. Diagnoses and descriptions are condensed but they are widely supplemented by the figures. Decisions on categorical rank of new species and subspecies have no relationship to a numerical standard of differential characters but are based on the differences of known species in each genus. Body sizes, quoted in mm refer to body length. Derivations of new names are found in the appendix.

ORDER AMPHIPODA
Suborder Gammaridea
Family Ampeliscidae

Ampelisca compressa Holmes
Figure 7 c

Ampelisca compressa Holmes. Barnard, 1960a: 31-32; 1964a: 213.

Antenna 1 of female reaching only to end of article 4 of antenna 2, flagellum with 5 articles, in contrast to populations of the open sea off southern California having antenna 1 reaching almost to the end of article 5 of the second antennal peduncle. Article 2 of peduncle of antenna 1 only 1.5 times as long as article 1, whereas in open sea specimens the article is twice as long as article 1. The entire first antenna is stunted in comparison to specimens from southern California. The head is more fully excavate below, appearing more narrow in the specimens from Bahía de Los Angeles.

Catalogued specimen. — USNM No. 111508, female, 6.7 mm, BLA 88.

Records.—Soft-bottoms, 15-46 m; in April, 152 individuals /m^2; in October with 9.0 individuals /m^2.

Distribution. — Western Atlantic Ocean; Caribbean Sea; eastern Pacific Ocean from Panamá to Puget Sound, Washington, 1-266 m.

Ampelisca cristata Holmes
Figure 7 a, b

Ampelisca cristata Holmes. Barnard, 1954a: 26-28, pls. 17, 18: 1964a: 213.

Female adults have article 2 of antenna about 1.9 times as long as article 1, in contrast to populations of the open sea off southern California having article 2 about 1.2 times as long as article 1. Juveniles have the open sea form of antenna 1 and subadults range from 1.4 to 1.7 in the relative length of article 2. The population in Bahía de Los Angeles is entirely of the microdentate form, having a minute tooth on pleonal epimeron 3. Uropod 3 has the outer ramus broader and more rounded apically than in specimens from southern California.

Records. — Soft-bottoms, 15-46 m; in April 527 individuals /m^2; in October with 43 individuals /m^2.

Distribution. — Caribbean Sea; eastern Pacfic Ocean from Ecuador to Tomales Bay, California, 6-152 m.

Ampelisca lobata Holmes

Ampelisca lobata Holmes. Barnard, 1954a: 11-14, pls. 5, 6; 1964a: 214.

Records. — Rocky intertidal on outer islands and at Vermilion Sea Field Station.

Distribution. — Caribbean Sea; eastern Pacific Ocean from Ecuador to Monterey Bay, California, 0-183 m.

Ampelisca mexicana Barnard

Ampelisca mexicana Barnard, 1954a: 45-46, pls. 31, 32; 1954b; 7; 1964a: 214.

Records. — Deep water zone of the bay, 25-46 m, primarily on silt-bottom but also on silty sand and fine sand.

Distribution. — Caribbean Sea at Bahía Caledonia, Panamá; eastern Pacific Ocean from Peru to Punta Canoas, Baja California, 9-73 m.

Ampelisca milleri Barnard

Ampelisca milleri Barnard, 1954a: 9-11, pls. 3, 4; 1964a; 215.

Material. — BLA SIO-X, one juvenile, 2.5 mm, fitting the description except for small differences; adults should be collected for better comparison.

Record. — Piedras Ahogadas, 24 m, shell fragment bottom.

Distribution. — Eastern Pacific Ocean from Ecuador and the Galápagos Islands to San Francisco Bay, California, 15-187 m; in shallow water at San Francisco.

Ampelisca schellenbergi Shoemaker

Ampelisca schellenbergi Shoemaker, 1933a: 3-5, fig. 2; 1942: 9. Barnard, 1954a: 14-16, pls. 7, 8; 1954b: 2.

Record. — Rocky intertidal of Vermilion Sea Field Station.

Distribution. — Caribbean Sea and Gulf of Mexico; eastern Pacific Ocean from Perú to Laguna Beach, California, 0-46 m.

Family Amphilochidae

Amphilochus neapolitanus Della Valle

Amphilochus neapolitanus Della Valle. Chevreux and Fage, 1925: 112-113, figs. 106-108. Barnard, 1962c: 126, fig. 3; 1964a:217; 1964b:105.

Record. — Sandspit north of village in tailings of fish sample.

Distribution. — Cosmopolitan in tropical and subtropical seas, 0-80 m.

Gitanopsis pusilloides Shoemaker

Gitanopsis pusilloides Shoemaker, 1942:9-11, fig. 3.

The unusual maxillipedal palp having 2 clavate spines on article 3 at the base of the finger is shown in the drawings.

Records. — Intertidal to 9 m on coarse substrate.

Distribution. — Bahía Magdalena, Baja California, possibly north to La Jolla, California; intertidal to about 20 m.

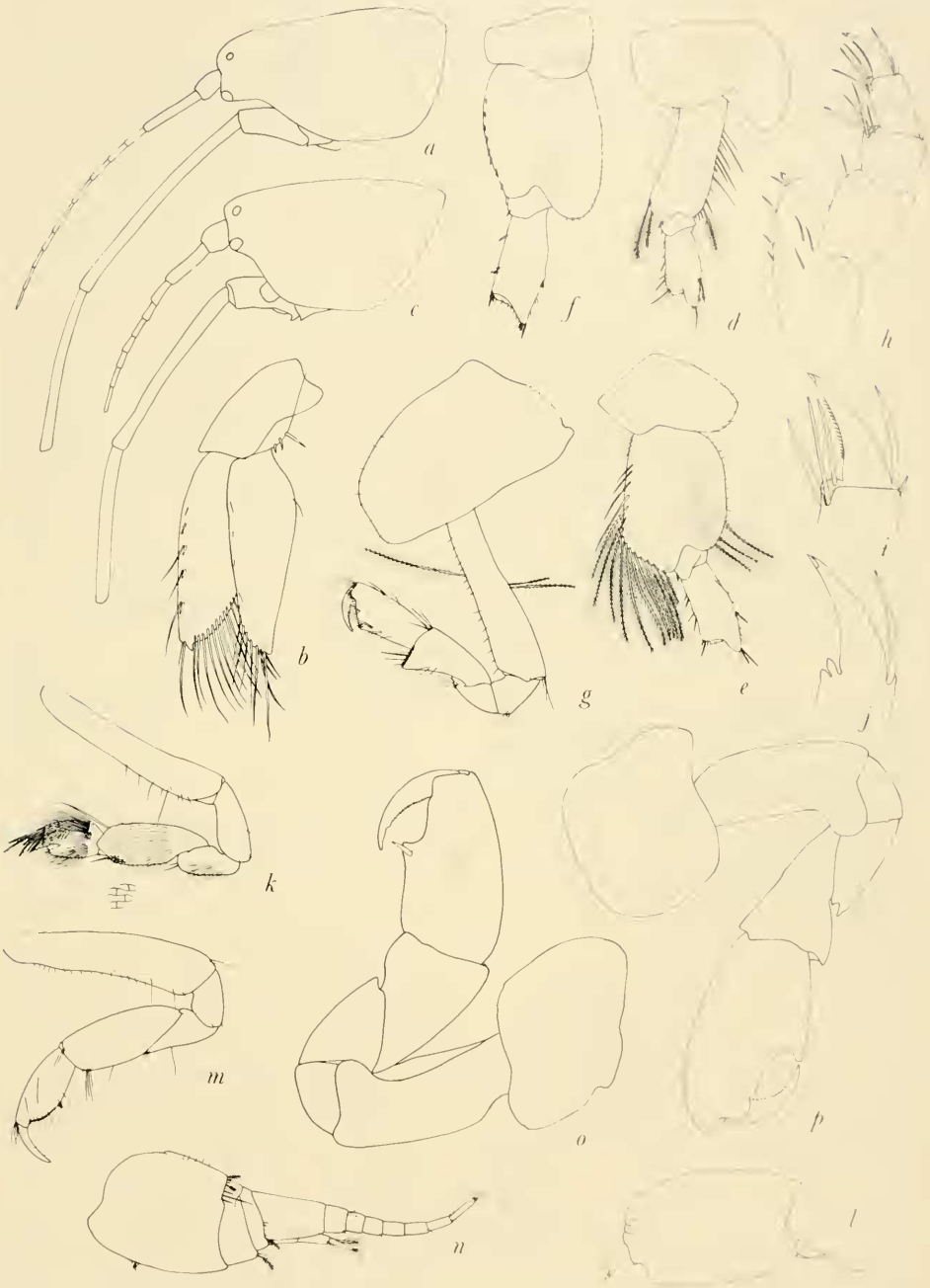

Figure 7. *Ampelisca cristata* Holmes, female, 7.0 mm, BLA 41: a, head; b, uropod 3. *Ampelisca compressa* Holmes, female, 6.7 mm, BLA 88: c, head. *Batea transversa coyoa*, new subspecies, female, 6.9 mm, BLA SIO-62-236: d, e, f, pereopods 3, 4, 5; g, gnathopod 2. *Gitanopsis pusilloides* Shoemaker, female, ovigerous, 1.8 mm, BLA 213: h, i, j, maxilliped and views of palp terminus, the latter with medial setae removed to show fused cusp-spines. *Hippomedon propinquus* Sars, female, 4.5 mm, BLA 103: k, l, gnathopod 2; m, gnathopod 1; n, antenna 1. *Ampithoe ramondi* Audouin, male, 6.3 mm, BLA SIO-62-210: o, p, gnathopods 1, 2.

Family Ampithoidae

Ampithoe plumulosa Shoemaker

Ampithoe plumulosa Shoemaker, 1938: 16-19, fig. 1; 1942: 39. Barnard, 1959a: 37; 1964b: 111; 1965: 20, figs. 11, 12.

Only juveniles and subadult females have been collected in BLA.

Record. — Intertidal at Vermilion Sea Field Station.

Distribution. — British Columbia to Ecuador, intertidal and shallow subtidal waters.

Ampithoe pollex Kunkel

Figure 8

Ampithoe pollex Kunkel, 1910: 92-94, fig. 36. Barnard, 1954c: 29-31, pls. 27, 28; 1959a: 37; 1964b, 111; 1965: 22-25, figs. 13, 14. Mills, 1964: 15-16.

Grubia indentata Stout, 1913: 656-657.

Three adult forms of this species occur in BLA. They may represent individuals hatched in different seasons.

Typical form, material: BLA 305 (3), SIO-62-216 (8): male gnathopod 2 is fully developed and has the dactyl and thumb meeting; specimens fit the descriptions given by Barnard (1965); maximum length about 5.5 mm.

Small form with aberrant gnathopod 2, material: SIO-62-215 (8); gnathopod 2 of the male has a shortened, thicker, more curved dactyl than in the typical form; the dactyl fails to meet the thumb; coxa 1 has a more excavate anterior margin than in the typical form; maximum length about 5.5 mm.

Large form with retarded gnathopod 2, material: BLA 305 (144), 306 (193); male gnathopod 2 is typical of juveniles although the body length exceeds 7.0 mm; the palmar tooth is poorly developed; specimens preserved in alcohol are more strongly pigmented than the other forms.

Material of juveniles and females not associated with males and thus unrecognizable as to form: BLA 214 (1), 306A (228), SIO-62-212 (3), 62-228 (3).

Records. — Intertidal on rocky shores.

Distribution. — Bermuda; eastern Pacific Ocean from Bahía de San Quintín, Baja California to Coos Bay, Oregon, intertidal and shallow sublittoral waters.

Ampithoe ramondi Audouin

Figure 7 o, p

Ampithoe ramondi Audouin. Shoemaker, 1942: 40. Barnard 1955a: 28-29 (with references); 1964a: 217; 1965: 25-27, figs. 15, 16.

Amphithoe vaillanti Lucas. Chevreux and Fage, 1925: 33-334, figs. 341, 242. Gurjanova, 1951: 880-881, fig. 614.

Ampithoe divisura Shoemaker, 1933b: 255-256, fig. 8.

Amphithoe intermedia Walker, 1904; 290-291, pl. 7, fig. 46. Chevreux, 1908: 515-516, fig. 29.

The references to this species have been condensed from a total of 55 or more published since 1900.

Male gnathopod 1 has a strongly excavate palm like that of male gnathopod 2. This is atypical of *A. ramondi* as found on the outer coast of Baja California and may indicate subspeciation.

Records. — Intertidal on rocky shores.

Distribution. — Tropicopolitan, phycophilous, intertidal; northern record in eastern Pacific Ocean at Bahía de San Ramón, Baja California.

Ampithoe tea Barnard

Ampithoe tea Barnard, 1965: 30-34, figs. 19-21.

The second antennal flagellum in both sexes is stouter than in the type-series. It resembles antenna 2 of *Ampithoe* sp. of Barnard (1965). Article 2 of pereopods 1-2 is short, as in the latter species. However, article 4 of antenna 2 is like that of the type series and is not shortened as in *Ampithoe* sp. Probably the latter is a rare individual of *Ampihoe tea* matching the phenotype in Bahía de Los Angeles but far removed geographically from its optimal home.

Records. — Intertidal on rocky shores; shell sand, 25 m.

Distribution. — Southern and Baja California from Santa Barbara and Catalina Island to Punta Eugenia and Guadalupe Island, intertidal to 67 m.

Family Aoridae

Acuminodeutopus periculosus, new species

Diagnosis. — Male gnathopod 1 having process of article 5 produced into 2 distal teeth, article 6 extending well beyond process of article 5; coxa 1 rather shallow, evenly extended forward; gnathopod 2 with article 2 distally expanded anteriorly, article 3 with long anterior process, longer than known for *A. heteruropus* Barnard (1959a); inner ramus of uropod 3 with 2 distal spines. Pereopods 1-2 similar to those of *A. heteruropus,* including 3 stout setae of article 5, otherwise with minor setal variations; pereopods 3-5 similar but with minor variations in setal placement; uropod 2 differing from that of *A. heteruropus* by possession of 2 marginal spines on outer ramus; eyes slightly larger and less elongated than those of *A. heteruropus.*

Holotype. — USNM No. 111461, male, 2.3 mm.

Type-locality. — BLA 39, April 24, 1962, 7 m.

Relationship.— Male gnathopod 1 of *Acuminodeutopus heteruropus* has a single tooth on article 5, a

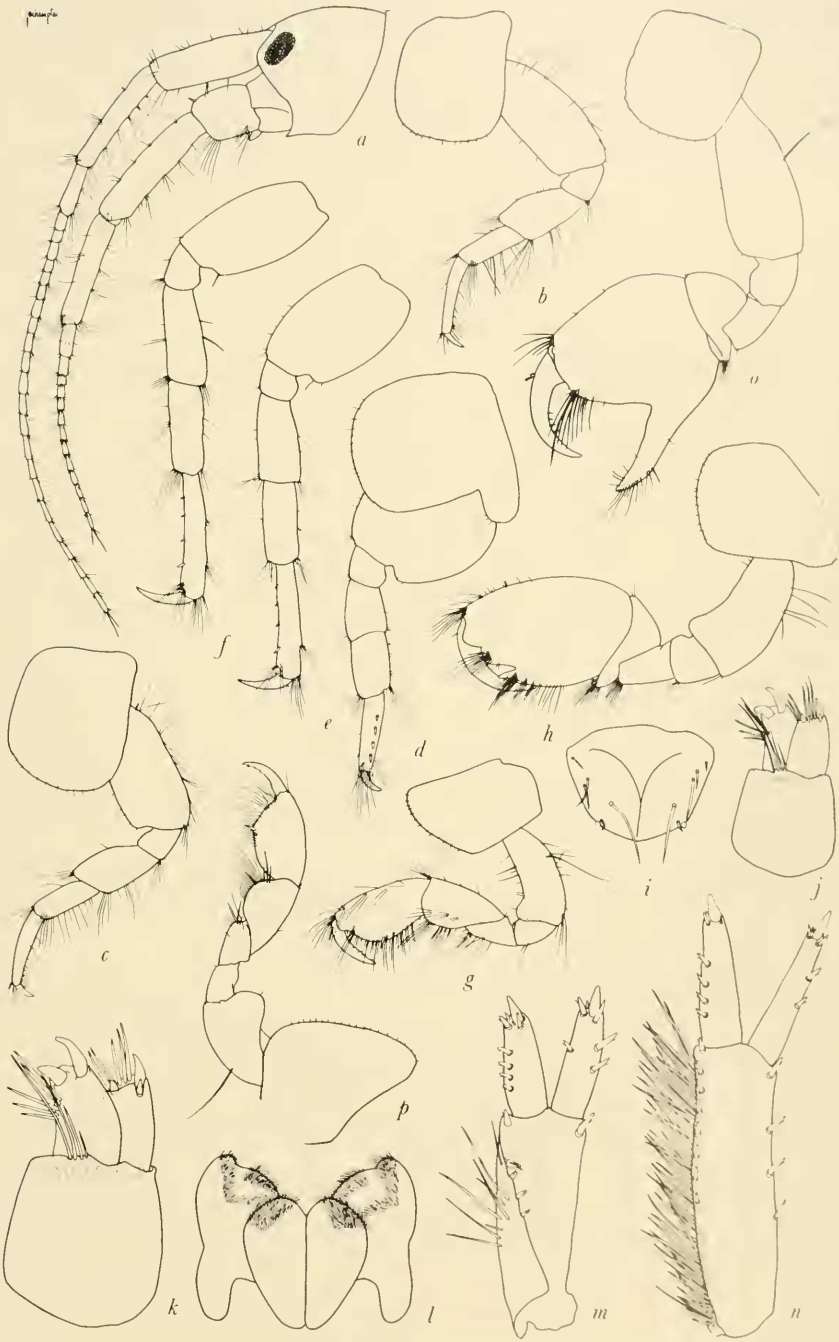

Figure 8. *Ampithoe pollex* Kunkel, male, 7.0 mm, BLA 305, large retarded form: a, head and antennae; b, c, d, e, f, pereopods 1, 2, 3, 4, 5; g, h, gnathopods 1, 2; i, telson; j, k, uropod 3; l, lower lip; m, n, uropods 1, 2. Male, 5.4 mm, BLA SIO-62-215, small aberrant form: o, p, gnathopods 2, 1.

Figure 9. **Acuminodeutopus periculosus,** new species, male, 3.0 mm, BLA 116: a, b, gnathopod 1; c, d, e, gnathopod 2; f, uropod 3. Female, 3.0 mm: g, h, gnathopods 1, 2.

short article 6, and gnathopod 2 has an unexpanded article 2 and no process on article 3. All males of *A. periculosus* have the double cuspidation on article 5 of gnathopod 1 but the size and shape of the teeth vary considerably.

Records. — Scattered along the shallowest perimeter on both sides of Bahía de Los Angeles in depths of 4 to 38 m, mainly shallower than 15 m, persistent in both seasons, on bottoms of coarse sand and shell, rarely on fine sands.

Lembos macromanus (Shoemaker)

Bemlos macromanus Shoemaker, 1925: 36-41, figs. 10-13.

Lembos macromanus. Barnard, 1962a: 9, fig. 3; 1964b: 110, chart 12.

The largest male, 9.0 mm long, from BLA SIO-62-235, was figured in Barnard (1962a); its first gnathopod is similar to that shown by Shoemaker (1925) and the pereon has 2 sternal teeth. Another male of SIO-62-212 has the first gnathopod like that of *L. concavus* as identified by Barnard (1962a) but lacks anterior setae on article 6 and has 3 sternal teeth on the pereon.

Records. — Rocky intertidal to at least 9 m on coarse substrate.

Distribution. — Gulf of California north to Estero de Punta Banda (Ensenada), Baja California, shallow-water and intertidal.

Microdeutopus schmitti Shoemaker

Microdeutopus schmitti Shoemaker, 1942; 18-21, fig. 6. Barnard, 1959a: 32-33, pl. 9; 1961: 180; 1964a: 218.

The male of SIO-62-212 has a strong, sharp tooth on the anterodistal edge of article 2 on gnathopod 2; the tooth on the fifth article of gnathopod 1 is blunt, nearly spatulate, and lacks accessory teeth.

Records. — Rocky intertidal to 44 m, primarily on coarse substrate.

Distribution .— Monterey Bay, California, to Cabo San Lucas, Baja California, 0-43 m.

Neomegamphopus roosevelti Shoemaker

Neomegamphopus roosevelti Shoemaker, 1942; 36-38, fig. 13. Barnard; 1962a: 10.

Records. — Rocky intertidal to 24 m on shell sand.

Distribution. — Border of Mexico-California (32°N) to Cabo San Lucas, Baja California, 11-42 m.

Rudilemboides stenopropodus Barnard

Rudilemboides stenopropodus Barnard, 1959a: 31-32, pl. 8; 1964b; 110, chart 14.

Records. — In April from rocky intertidal to 38 m, with most of the records below 9 m; in October from 4 to 19 m, with most of the records from 9 m or less.
Distribution. — Pt. Conception, California to Bahía de San Quintín, Baja California, 1-68 m.

Family Argissidae

Argissa hamatipes (Norman)

Argissa hamatipes (Norman). Walker, 1904: 246. Stebbing, 1906: 277. Shoemaker, 1930: 37-40, figs. 15, 16. Stephensen, 1931: 261; 1935: 140; 1940: 41; 1944: 52. Gurjanova, 1951: 327-328, fig. 193. Barnard, 1962c: 151.
Argissa typica Boeck. Sars, 1895: 141-142, pl. 48.
Record. — Reef between Isla Ventana and Isla Cabeza de Caballo, shore.
Distribution. — North Atlantic in Gulf of St. Lawrence, Kattegat and northern Britain to Kola Bay; Greenland; Chukchi, Bering, Okhotsk and Japan seas; California; 4-1096 m.

Genus *Batea* Muller

Occasionally fully adult but more often juvenile specimens of both *Batea transversa* and *Batea rectangulata* have the evanescent teeth on the third pleonal epimera typical of *Batea lobata*. These are considered as mutants. *Batea lobata* is distinguished from *B. catharinensis* largely by this difference, the evanescence of teeth on the third pleonal epimera, although the gnathopods are slightly different. *Batea lobata* might be considered a Pacific race of the Atlantic *B. catharinensis*, but a second Pacific cognate of *B. catharinensis*, sympatric with *B. lobata*, is described below.

Key to Species of *Batea* (Note that coxa 1 is absent in this genus)

1a. Coxa 2 quadrate ..... *rectangulata*
b. Coxa 2 subtriangular 2
2a. Palm of gnathopod 2 oblique 3
b. Palm of gnathopod 2 nearly transverse ..... *transversa*
3a. Teeth of third pleonal epimeron well developed 4
b. Teeth of third pleonal epimeron obsolescent ..... *lobata*
4a. Articles 5 and 6 of gnathopod 2 equal in length; lobe on article 2 of pereopod 3 poorly developed; distal half only of inner margin of mandibular palp article 2 setose; rostrum evenly tapering ..... *susurrator*, n.sp.
b. Article 5 of gnathopod 2 slightly shorter than article 6; lobe on article 2 of pereopod 3 well developed; all of inner margin of mandibular palp article 2 setose; rostrum tapering unevenly ..... *catharinensis*

Batea rectangulata Shoemaker

Batea rectangulata Shoemaker, 1925: 31, figs. 7-9; 1926: 9-13, figs. 5-7.

Although other species of *Batea* in Bahía de Los Angeles differ from their cognates or their warm-temperate relatives, this species, originally described from Bahía de San Francisquito, Gulf of California, does not. Gnathopods, pereopods, head, and pleonal epimera correspond to those figured or described by Shoemaker.
Records. — In April from 7 to 40 m, primarily below 15 m, on coarse sand and shell, scarce on fine sand; in October occurring sparsely between 2 and 9 m.
Distribution. — Bahía de San Francisquito, Gulf of California.

Batea susurrator, new species

Figure 10

Diagnosis. — Rostrum tapering acutely and almost evenly; postantennal corner of lateral cephalic lobe sharp, quadrate; mediodistal edge only of mandibular palp article 2 setose; lower lip lacking medial lobes; articles 5 and 6 of gnathopod 1 subequal in length, both relatively thinner than in *B. catharinensis* (see Shoemaker, 1926), palm oblique, slightly shorter than posterior edge of article 6, thus palm shorter than in *B. catharinensis;* coxa 1 subtriangular; posterodistal corner of article 2 on pereopod 3 nearly quadrate, not lobate; posteroventral rounded margin of article 2 on pereopod 5 with deep slit, article 2 slightly broader than in *B. catharinensis;* telson cleft slightly less than halfway, edges proximally appressed closely, distally gaping; posterior edge of third pleonal epimeron strongly serrate in adult, weakly in juveniles. Pleonal epimera, uropods and mouthparts, except for mandibular palp and lower lip resemble those of *B. catharinensis;* maxilla 1 with more setae on inner plate than in *B. catharinensis* despite size differences: when outer plate of maxilliped bears 2 spine-setae distally, inner plate of maxilla 1 bears 8 setae; in *B. catharinensis* when outer plate of maxilliped bears 4 spine-setae, inner plate of maxilla 1 bears only 5 setae. Antenna 1 of *B. susurrator* bearing a distal cusp on medial surface of article 1, not known for *B. catharinensis*.
Holotype. — USNM No. 111485, male, 4.2 mm.
Type-locality. — BLA 132, April 22, 1962, 25 m.
Relationship. — This species differs from its cognate of the Caribbean-western Atlantic, *B. catharinensis*, by the lack of proximal setation on the medial edge of mandibular palp article 2; the shape of gnathopod 2, its palm and posterior lobe of article 5; the lack of a prominent lobe on article 2 of pereopod 3; the evenly tapering rostrum. *Batea susurrator* resembles *B. transversa* Shoemaker (1926) but differs from that species in the absence of a lobe on article 2 of pereopod 3, the much larger second gnathopod with its more prominent and oblique palm, and the posterior lobe of article 5. *Batea susurrator* might be con-

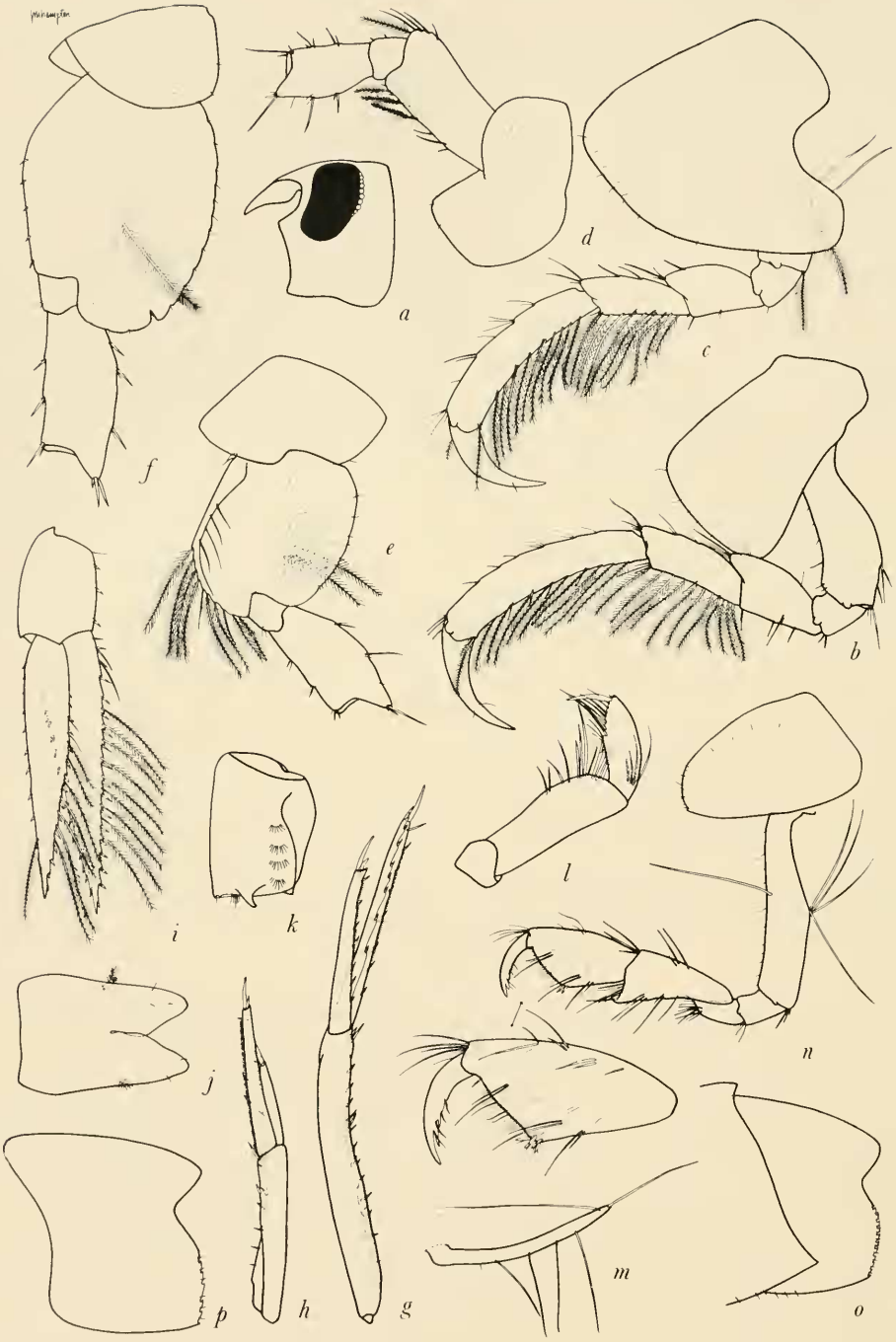

Figure 10. **Batea susurrator,** new species, male, 4.3 mm, BLA 132: a, head; b, c, d, e, f, pereopods 1, 2, 3, 4, 5; g, h, i, uropods 1, 2, 3: j, telson; k, medial surface of article 1 of antenna 1; l, mandibular palp; m, n, gnathopods 1, 2; o, pleonal epimera 2-3, left to right. Juvenile, 2.4 mm: p, pleonal epimeron 3, left side.

fused with adults of *B. lobata* Shoemaker (1926) but again, the lack of a third pereopodal lobe, the larger gnathopod 2, and the sharper lateral cephalic lobes distinguish it, although the well-developed serrations of the adult third pleonal epimeron are significant. Juveniles of *B. susurrator* have poorly developed serrations but their other characters do not match those of *B. lobata*.

Records. — Ranging from 9 to 37 m in depth, most abundant in 25 m on coarse gray sand.

Batea transversa coyoa, new subspecies

Figure 7 d, e, f, g

Diagnosis. — Differing from *B. t. transversa* Shoemaker (1926), by absence of posteroventral lobe on article 2 of pereopod 3, by the more slender second articles of pereopods 4 and 5, the very slightly shorter fifth article of gnathopod 2 and by the more oblique palm.

Holotype. — USNM No. 111458, female, 6.9 mm, ovigerous.

Type-locality. — BLA SIO-62-236, south arm of Bahía de Los Angeles, April 26, 1962, ca. 30 m, shrimp trawl on N-S line between stations 156 and 45, coll. by Dr. Carl L. Hubbs' party.

Relationship. — *Batea susurrator* differs from *B. t. coyoa* in the expanded article 6 of gnathopod 2 and the presence of a slit on article 2 of pereopod 5. *Batea t. coyoa* resembles a specimen of *B. t. transversa* from Catalina Harbor California (Shoemaker, 1926, figs. 9 and 11) more than it does another specimen from Pt. Loma, California (Shoemaker, 1926, figs. 8 and 10). Correspondence is noted in the shapes of coxae 5-6 and articles 5-6 of gnathopod 2. Gnathopod 1 of *B. t. coyoa* resembles that in figure 9c of Shoemaker, especially notable being the contrast to *B. susurrator* and *catharinensis* in number, size, shape and arrangement of setae.

Records. — On coarse substrate from 9 to 30 m.

Distribution of *B. t. transversa*. — Southern California, 2-27 m.

Carinobatea Shoemaker, 1926

Carinobatea differs from *Batea* in the presence of dorsal cusps on posterior segments and the elongate article 1 of the palp on maxilla 1. Heretofore the absence of inner lobes on the lower lip of *Carinobatea* appeared significant as a generic character but the type-species of *Batea*, *B. catharinensis* (Atlantic) also lacks inner lobes. The Pacific members of *Batea* have inner lobes and this should be evaluated as a generic character.

If dorsal cusps alone were the characters distinguishing *Carinobatea* from *Batea*, there would be good cause to synonymize the genera because this kind of difference has rarely proved significant in other Gammaridea. Characters other than the first maxillary palp are assorted in *Carinobatea* much as they are in *Batea* and this would suggest a polyphyletic origin of the several species of *Carinobatea* from those of *Batea*. But, the consistency in first maxillary palp indicates a monophyletic development of *Carinobatea*.

Heretofore the enlarged process on article 1 of antenna 1 in members of *Carinobatea* represented a good generic character, but a new species to be described below has the small process typical of *Batea*.

Carinobatea conductor, new species

Figure 11

Diagnosis. — Rostrum of medium length and stoutness in contrast to other species of *Carinobatea* (having either shorter or longer rostra); distoventral tooth of article 1 of antenna 1 smaller than in other species; gnathopod 1 bearing only 2 distal setae (in contrast to 6 or more in other species); gnathopod 2 with short article 3 (in contrast to its elongation in *C. cuspidata* Shoemaker, 1926), article 5 longer than 6, its posterior lobe shallow and not pointing distally, palm oblique, equal to posterior margin of article 6; article 2 of pereopod 3 linear, lacking posterodistal lobe; posterodistal lobe of article 2 of pereopod 5 broadly expanded and deeply rounded (in contrast to *C. carinata* Shoemaker, 1926, having a shallow, quadrate lobe); lateral margin of peduncle of uropod 1 with about 10 spines (compared with 24 in *C. cuspidata* and about 11 in *C. carinata*); uropod 3 with flat, broad, heavily setose rami (in contrast to *C. carinata* but not *C. cuspidata*); pleonites 1 and 2 each with small dorsal tooth, pereonite 7 lacking tooth (in contrast to other species).

Holotype.—USNM No. 111495, ? male, 4.0 mm.

Type-locality. — BLA SIO-62-216, reef between Isla Ventana and Isla Cabeza de Caballo, shore, debris of fish sample, April 21, 1962, coll. Dr. Carl L. Hubbs and party.

Relationship. — Similarities and contrasts to other species are stated in the diagnosis. The diversity of characters among species of *Carinobatea* is much stronger than in *Batea* with differences in dorsal body cusps, length of article 3 of gnathopod 2, striking differences in uropod 3 (see *C. cuspidata*), peduncular spines of uropod 1, article 2 of pereopod 5, and the cusp on article 1 of antenna 1. In their linear second articles of pereopod 3 all species of *Carinobatea* resemble *Batea susurrator*, *B. transversa coyoa* and *B. catharinensis*.

Mouthparts of *C. conductor* correspond to those figured by Shoemaker for *C. cuspidata*, especially in the 4.0 mm male. The larger, 5.0 female has only a single accessory seta on article 3 of the mandibular palp; both sexes have a small distal cusp concealed in the terminal setae of that article; the inner plate of maxilla 1 has 5-6 setae; in the female the first palp article of maxilla 1 is not as elongate as in both sexes of *C. cuspidata* but the distal end of the palp is more strongly armed.

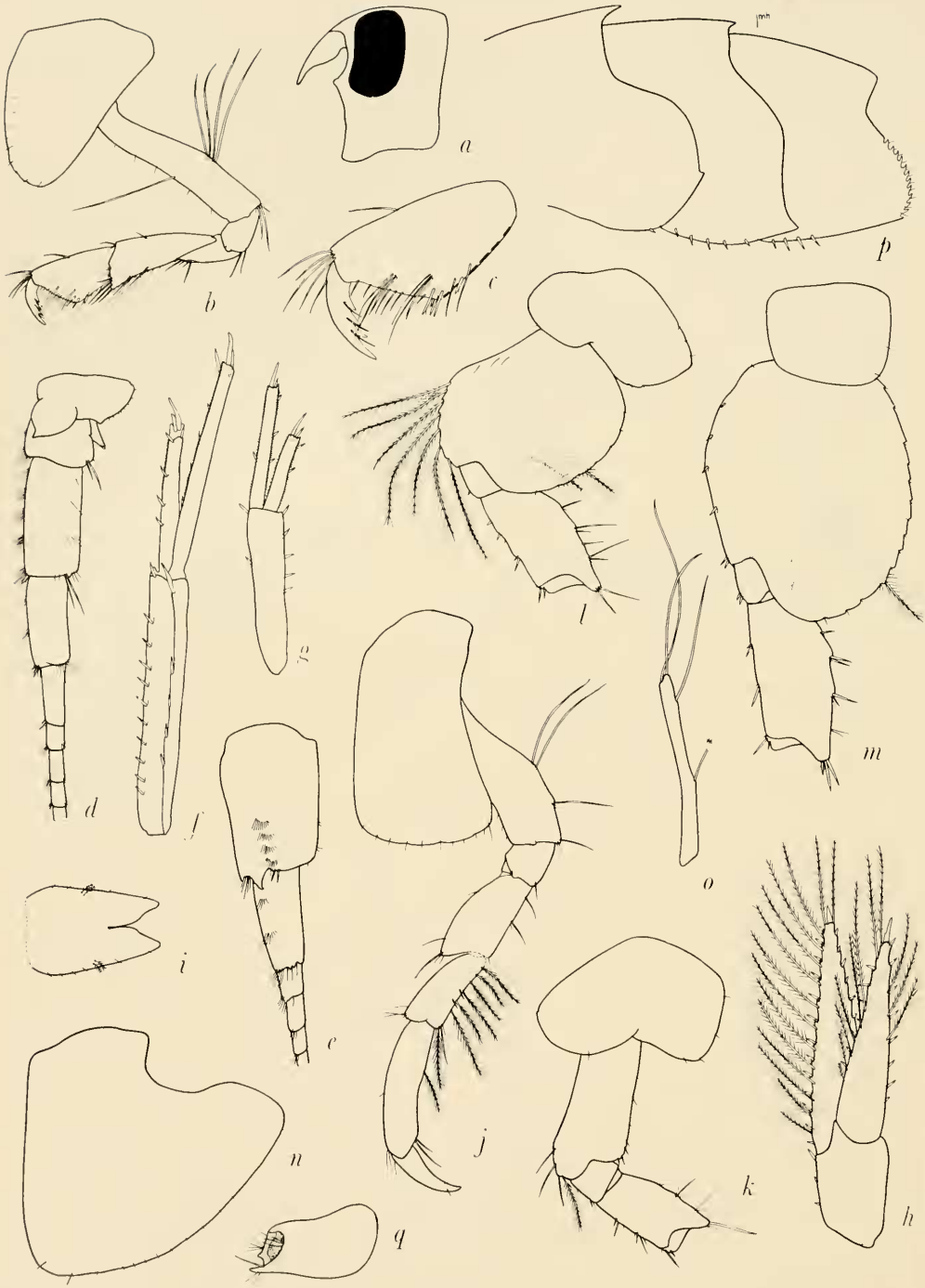

Figure 11. **Carinobatea conductor,** new species, male, 4.0 mm, BLA SIO-62-216: a, head; b, c, gnathopod 2; d, e, medial surfaces of antennae 2, 1; f, g, h, uropods 1, 2, 3; i, telson; j, k, l, m, pereopods 1, 3, 4, 5; n, coxa 4; o, gnathopod 1. Female, 5.0 mm: p, pleonal epimera 1-3, left to right; q, lateral surface of article 1 of antenna 1.

Family Corophiidae

Corophium baconi Shoemaker

Corophium baconi Shoemaker, 1934: 356-359, fig. 1; 1949, 82. Barnard, 1959a: 38; 1961: 182; 1964b: 111-112, chart 16; 1964a: 219.

Records. — Rocky intertidal to 9 m.

Distribution. — Generally a species of lagoons and estuaries but occurring in the open sea from Perú to the Bering Sea; off southern California in depths of 9-55 m and in 1-2 m in enclosed bays and harbors.

Corophium uenoi Stephensen

Corophium uenoi Stephensen 1932: 494-498, figs. 3, 4. Barnard, 1952: 28-32, pls. 8, 9; 1959a: 39. Nagata, 1960: 178. Barnard, 1961: 183; 1964b: 112, chart 16.

The accessory tooth above the large ventral tooth on article 4 of male antenna 2 is slightly larger and blunter than in specimens from southern California.

Records. — Rocky intertidal of Vermilion Sea Field Station.

Distribution. — Japan; eastern Pacific Ocean from Monterey Bay, California at 24 m, to Bahía de San Quintín, Baja California, rarely occurring in the open sea, more often in lagoons and estuaries, such as Morro Bay, Newport Bay, and Bahía de San Quintín, intertidal to 2 m.

Ericthonius brasiliensis (Dana)

Ericthonius brasiliensis (Dana). Barnard, 1955a: 37-38; 1959a: 39; 1961: 183; 1964a: 219.

Records. — From 0 to 42 m, primarily on intertidal or very shallow sand bottoms.

Distribution. — Cosmopolitan in tropical, warm-temperate and some boreal seas, 0-130 m.

Rildardanus, new genus

Diagnosis. — Antenna 2 strongly ornamented; mandibular palp 3-articulate; inner plates of maxillipeds broad, flat; gnathopod 1 in male much larger than 2, both pairs subchelate; accessory flagellum uniarticulate, vestigial; inner rami of both uropods 1 and 2 scale-like, vestigial; uropod 3 composed only of a setose peduncle; telson a large subcircular, simple flap.

Type-species. — **Rildardanus tros,** new species.

Relationship. — The shortened, scale-like inner rami of uropods 1-2 relate this genus to *Pseudericthonius* Schellenberg (1926), but that genus has a well-developed third uropod with a long ramus. *Concholestes* Giles (1888) is the only other genus in the Corophiidae lacking rami on uropod 3 but the rami of uropod 1 of that genus are not reduced, gnathopod 2 is larger than 1 and the second antenna is not ornamented. The unelongate first urosomal segment prevents assignment of this genus to the Podoceridae. Gnathopods of *Rildardanus* resemble those of *Unciola* most closely and probably *Rildardanus* is allied to that genus, especially in view of the similarity of pleonal epimera (Sars, 1895, pl. 222), coxae, pereopods and mouthparts. This genus differs from *Unciola* in the loss of the ramus of uropod 3, further enlargement and special ornamentation of male antenna 2 and almost complete loss of the accessory flagellum. The second antennae are ornamented as much as or more than they are in *Corophium* but the mouthparts and gnathopods strongly differ in *Rildardanus* (compare *Corophium* in Sars, 1895, pls. 219-221).

Rildardanus tros, new species

Figures 12, 13

Diagnosis. — With characters of the genus.

Description of male. — Rostrum small, acute; lateral cephalic lobes rounded, article 3 of antenna 2 overriding them and fitting behind a ventral accessory lobe; eyes small, composed of few ommatidia; article 1 of antenna 1 bearing 4 ventral spines and medial ridge with 5 spines; article 2 as long as 1; article 3 shorter than 1, accessory flagellum minute, uniarticulate; antenna 2 fitting snugly to oblique lower edge of head, article 1 large, triangular, article 2 evanescent laterally, evidenced by its blunt gland-cone, article 3 broadened, with 1 dorsal spine on a poorly developed process distally produced laterally, medial face with semicircle of stout spines; article 4 more slender, mediodistal end strongly produced acutely and bearing apical spine, lower edge when properly turned showing 5 ventral cusps each with stout spines; article 5 very slender, about as long as 4; lateral surfaces of pereonites with bulges just dorsal to coxae; anterior coxae small and acute anteriorly, fifth coxa largest, last 3 coxae with small, hemispherical posterior lobes; gnathopods small, first larger than second, article 5 short, with blunt posterior lobe, article 6 long, stout, posteroproximal end of article 6 produced into blunt tooth defining false palm, finger slightly overlapping defining process, inner edge armed with sharp cusps; gnathopod 2 slender, articles 5 and 6 equal in length, article 5 poorly setose anteriorly and lacking posterior lobe, palm of article 6 transverse, somewhat cheliform, defined by stout spine, dactyl overlapping palm; pereopods simple, each sixth article with small distal spine at base of dactyl, pereopods 4 and 5 equal in length, pereopod 3 very short, second articles of last 3 pereopods bearing plumose setae on both anterior and posterior edges; pleopods well-developed, decreasing in size slightly from pleopod 1 to pleopod 3, each pleopod armed with 1 or 2 rasp-like coupling hooks; pleonites distinct, lateral surfaces of 4 and 5 with ridge, first 2 pleonal epimera with sinuoconvex posterior edges and sharp cusps at posteroventral corners, third pleonal epimeron with cusp produced from anterior portion of ventral edge; uropod 1 slightly exceeding uropod 2, uropod 2 very short, inner rami about one fourth as long as outer, scale-like, each armed with distal spine, uropod 3 a simple, asymetrically expanded, terminally setose peduncle attached to remnant of pleonite 6 below telson; telson a large, subcircular, simple flap; mouthparts

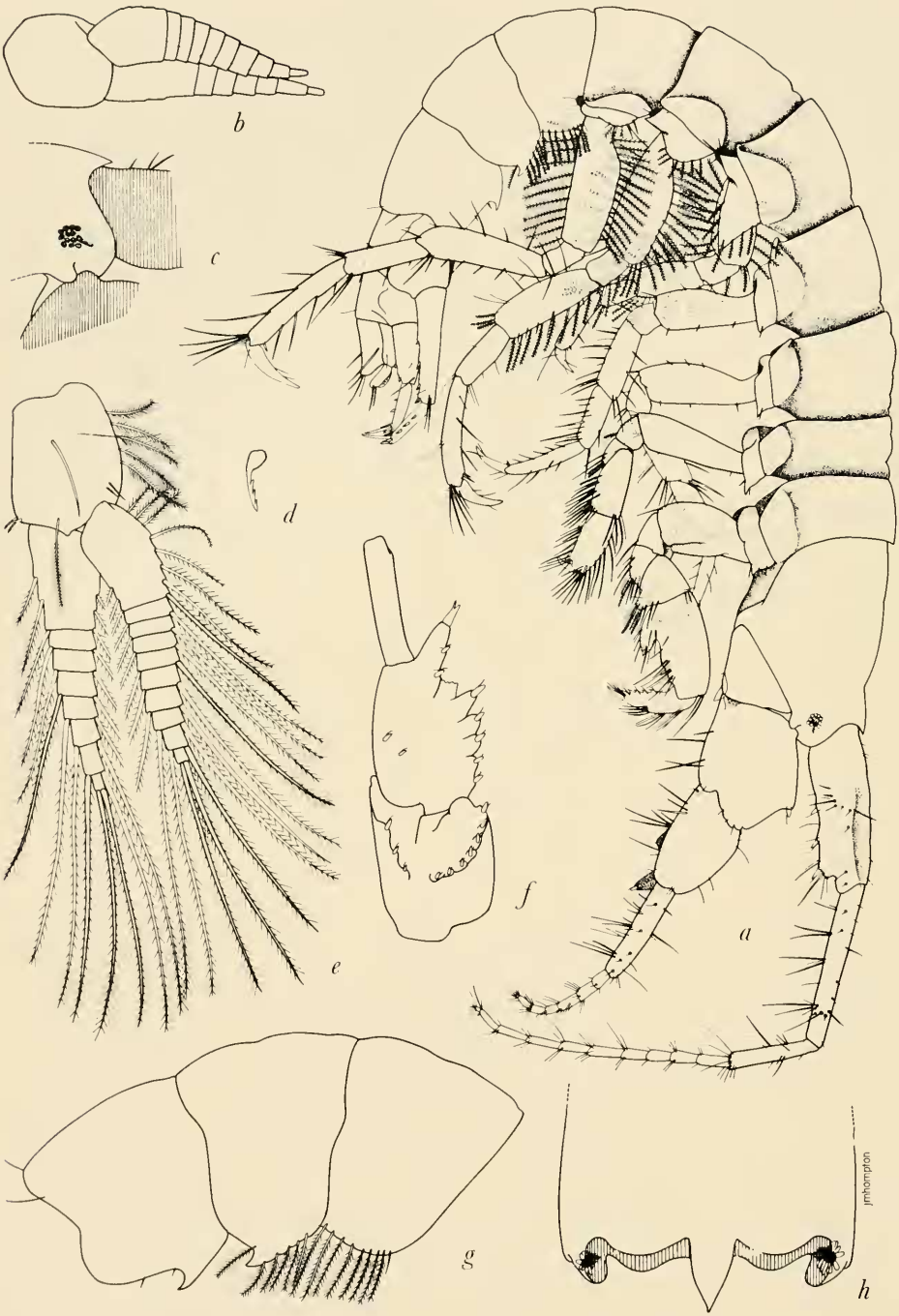

Figure 12. **Rildardanus tros,** new genus, new species, male, 4.5 mm, BLA 212: a, lateral view; b, pleopod 3, minus setae; c, lateral view of head showing coupling process of antenna 2; d, coupling spine of pleopod; e, pleopod 1, plumosities of setae shortened and reduced in number for clarity; f, medial view of antenna 2, minus setae; g, pleonal epimera 1-3, left to right; h, dorsal view of head.

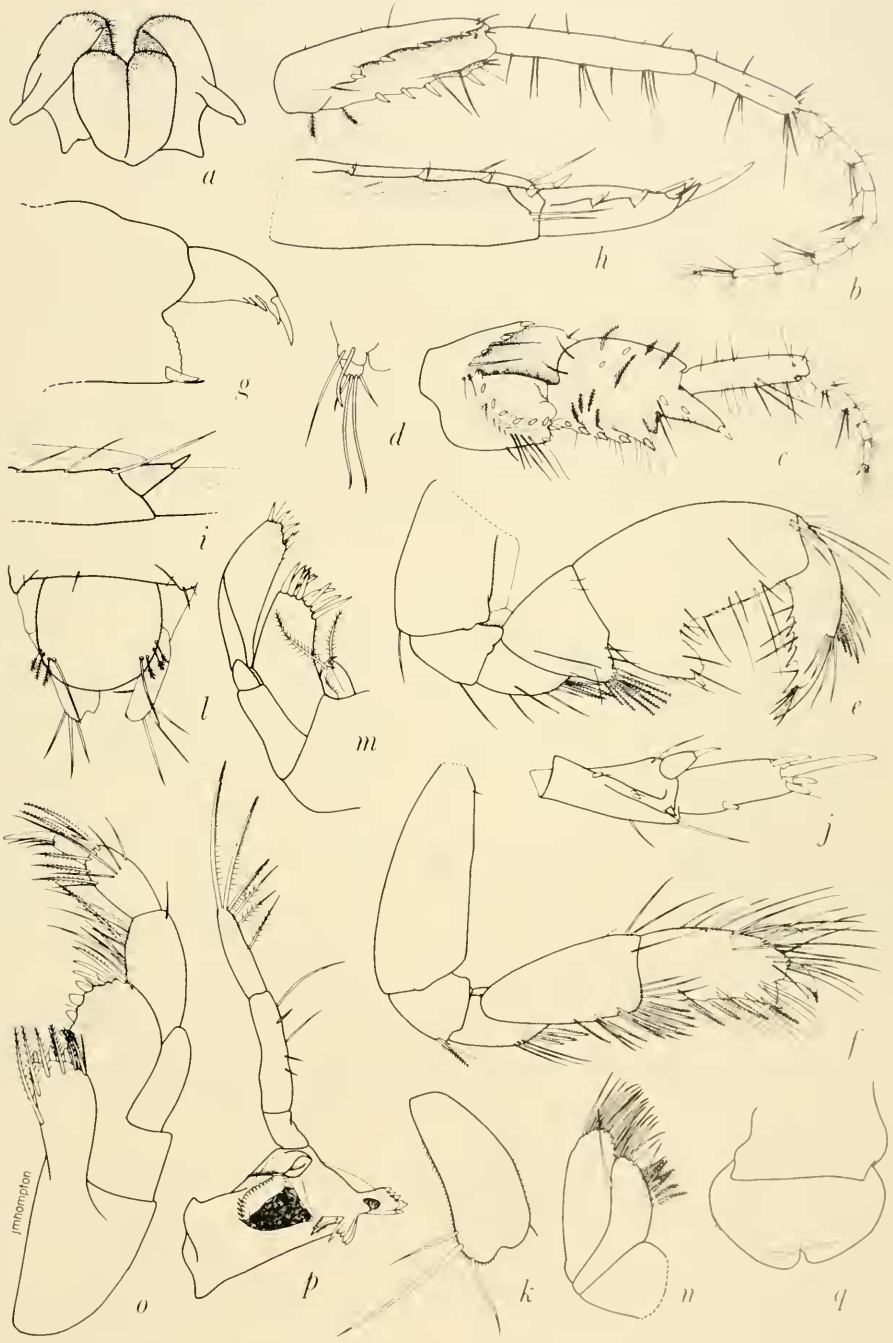

Figure 13. **Rildardanus tros,** new genus, new species, male, 4.5 mm, BLA 212: a, lower lip; b, c, antennae 1, 2, medial views; d, accessory flagellum; e, gnathopod 1; f, g, gnathopod 2; h, i, uropod 1, lateral and medial views showing small inner ramus; j, k, uropods 2, 3; l, dorsum of telson and third uropods; m, n, maxillae 1, 2; o, maxilliped; p, mandible; q, upper lip.

figured, generally typical of unciola-ericthonius corophiids, outer plate of maxilla 1 with 9 spines. Female unknown.

Holotype. — USNM No. 111518, male, 4.5 mm.

Type-locality. — BLA 212, main west shore of Bahía de Los Angeles, west of Isla Ventana, dredge of sand bottom, *Ulva* and gracilarioids, 9-16 m, April 28, 1962.

Family Dexaminidae

Polycheria osborni Calman

Figure 25 g

Polycheria osborni Calman, 1898: 268-269, pl. 32, fig. 2. Skogsberg and Vansell, 1928: 268-282, figs. 1-26. *Polycheria antarctica* (Stebbing). Alderman, 1936: 63. Barnard, 1954c: 21 (not Stebbing, 1888).

Except for a greater setosity of mouthparts, uropods and thoracic appendages, these specimens fit the morphology depicted by Skogsberg and Vansell (1928). The pleonal epimera are drawn here because they were not decribed by Skogsberg and Vansell. Coxae 1 and 2 are less strongly produced and the mandibular lobes are better developed in BLA specimens than in those from Monterey Bay, California, described by Skogsberg and Vansell.

So much variation has been demonstrated for *P. antarctica* in the southern hemisphere (especially by Schellenberg, 1931), that through a series of changes *P. osborni* has become a synonym of *P. antarctica* (*P. osborni* to *P. tenuipes* by Stebbing, 1906; *P. tenuipes* to *P. antarctica* by Stebbing, 1910). Skogsberg and Vansell indicated the inadvisability of such changes. A character that seems to distinguish *P. osborni* from other known species and formae is the dense setation of the ventrolateral margin of the peduncle of uropod 1; the pleonal epimera also may be characteristic but they require description on various forms.

Record. — Rocky intertidal, in tunicates, Vermilion Sea Field Station.

Distribution. — Puget Sound, Washington to southern California (32° N), intertidal, especially in amarouciid tunicates.

Family Eusiridae

Pontogeneia nasa, new species

Figures 14, 15

Diagnosis of male. — Rostrum decurved, scarcely tapering, extending twice as far as lateral cephalic lobes, the latter disymmetrically rounding, anteroventral margin of head straight, then slightly attenuated to acute corner; eyes large; mandibular palp massive, article 2 broad, strongly setose mediodistally, article 3 more than 80 percent as long as article 2, setose medially for most of its free length; inner plate of maxilla 1 with 3 terminal-subterminal setae, lateralmost very massive, medialmost subterminal; apices of inner maxillipedal lobes narrower than in *P. longleyi* Shoemaker (1933b); posterodorsal ends of pleonites 1-2 projecting above following segments as in *P. longleyi* and *P. quinsana* Barnard (1964b); third pleonal epimeron serrate behind, first and second epimera with small tooth and notch at posteroventral corners; second articles of all pereopods somewhat thinner and relatively longer than in *P. longleyi* and *P. quinsana;* rami of uropod 2 shorter than in *P. quinsana* and telson more deeply cleft, not as deeply as in *P. longleyi;* male gnathopods like those of *P. quinsana,* gnathopod 1 slightly larger than 2, article 5 of gnathopod 2 with narrow, sharp, somewhat distally pointing lobe, posterior margins of sixth articles of both pairs of gnathopods with 5-6 sets of stout spines, palm with larger spine on each side, palm poorly defined from posterior margin of article 6 if judging by length of dactyl; dactyls of all pereopods with striate medial ridge (also shown by Shoemaker for *P. longleyi);* antennae two thirds as long as body, armed with sense organs.

Female. — Serrations of third pleonal epimeron poorly developed; fifth articles of gnathopods similar to male, sixth articles small, narrow, palms oblique, spines at defining corners more numerous than in most female pontogeneias; mandibular palp with article 2 scarcely broadened.

Mouthparts (mandibular body, outer plate and palp of maxilla 1, maxilla 2, outer plate and palp of maxillipeds) like those of *P. longleyi* except as stated or figured; lower lip with outer lobes narrower than in *P. longleyi.*

Holotype. — USNM No. 111418, male, 5.0 mm.

Type-locality. — BLA SIO-62-235, north of BLA village sandspit, beach poisoning, shore, debris of fish sample, April 26, 1962 Dr. Carl L. Hubbs and party coll.

Relationship. — Resembles *Pontogeneia quinsana* Barnard (1964b) in the unusual serrations of the third pleonal epimera and the shape of the rostrum. The latter feature also occurs in *P. longleyi* Shoemaker (1933b), the male of which is unknown. The second articles of the pereopods are narrower in *P. nasa* than in the other two species and small details of serrations are different (compare figures of the various species); the serrate third pleonal epimera differentiate the new species from *P. longleyi* as does the long third mandibular palp article and the very broad second article differentiates *P. nasa* from both species. The telsonic cleft is intermediate in size, and the spination of the male gnathopods differs from that of *P. quinsana.* The distal articles of the pereopods of *P. quinsana* are not known but the striated ridges of the dactyls are apparently similar to those of *P. longleyi.*

The female has article 5 of gnathopod 2 projecting more strongly and turned more distally than in *P. longleyi* or *P. quinsana.*

Record. — Rocky intertidal to subintertidal on coarse substrate.

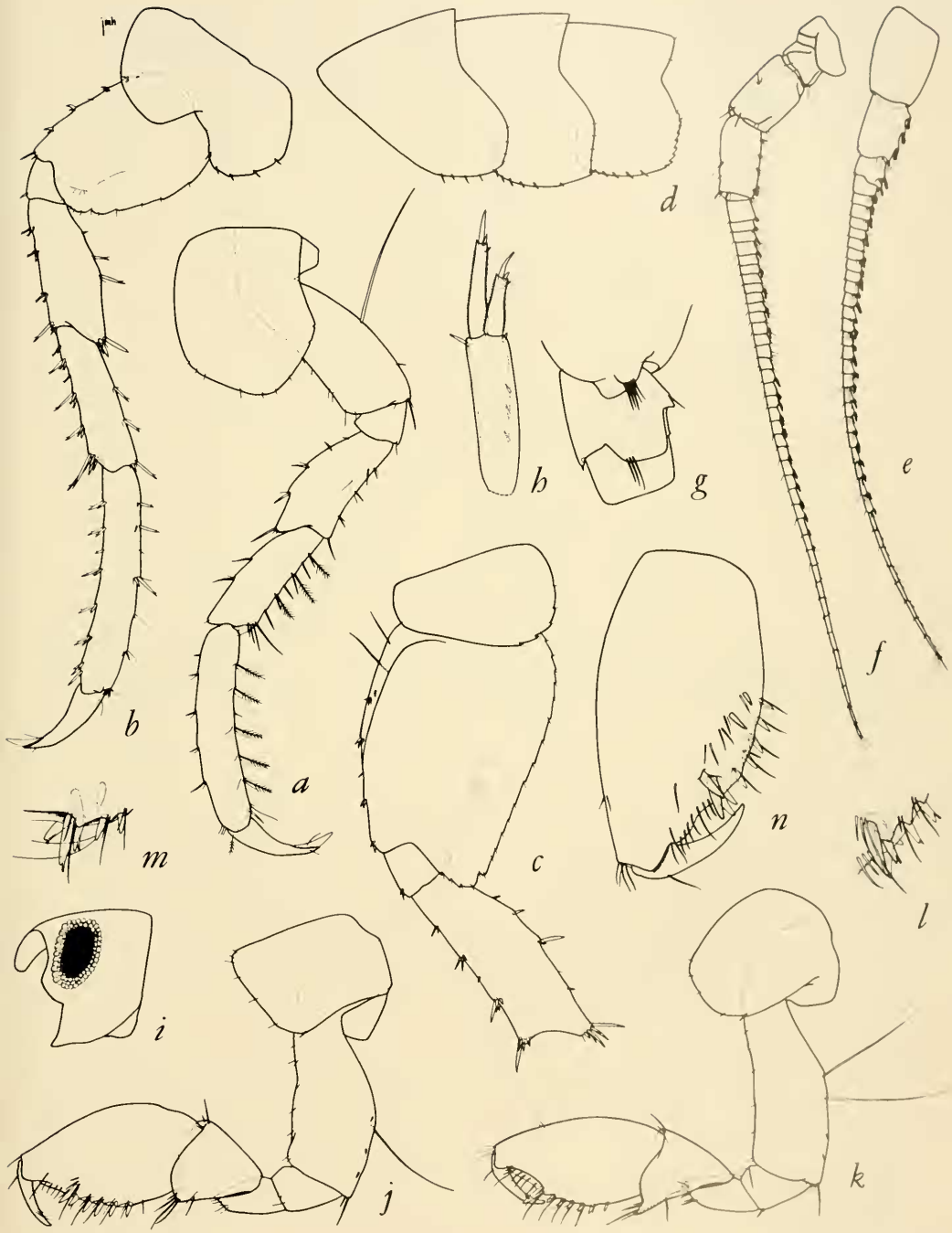

Figure 14. **Pontogeneia nasa,** new species, male, 5.0 mm, BLA SIO-62-235: a, b, c, pereopods 2, 3, 5; d, pleonal epimera 1-3, left side; e, f, antennae 1, 2; g, articles 2, 3, 4 of antenna 1, medial; h, ventral surface of uropod 2; i, head; j, k, gnathopods 1, 2; l, m, defining spines of palms of gnathopods 1, 2; n, medial surface of articles 6-7 of gnathopod 2.

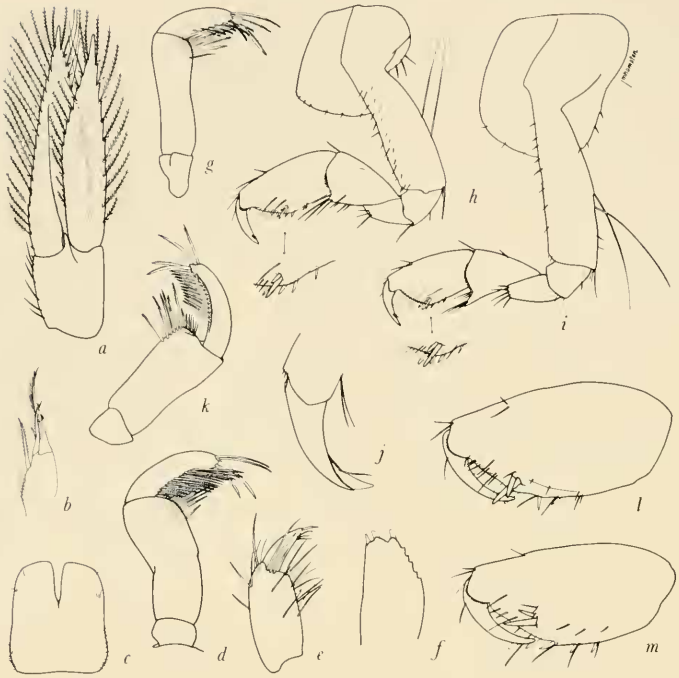

Figure 15. **Pontogeneia nasa,** new species, male, 5.0 mm, BLA SIO-62-235: a, uropod 3; b, inner plate of maxilla 1; c, telson; d, mandibular palp; e, articles 3-4 of maxillipedal palp; f, inner plate of maxilliped. Female, 5.4 mm: g, mandibular palp; h, i, gnathopods 1, 2; j, dactyl of pereopod 1. Male, 5.1 mm: k, mandibular palp. Male, young 4.6 mm: l, m, medial surfaces of articles 6-7 of gnathopods 1, 2.

Rhachotropis luculenta, new species
Figure 16

Diagnosis of male. — Head flattened, with very long, decurrent rostrum, lateral cephalic lobes strongly projecting, falciform, apically obtuse; eyes very large, extending onto dorsal surface of head; mandibular palp article 2 about 80 percent as long as article 3; only pleonites 1 and 2 with posterodorsal tooth, segment 3 with 2 small posterior cusps on each side; pleonites 1-2 with posterolateral tooth on each side, that of segment 2 connected to a lateral carina; pleonal epimera rounded at posteroventral corners, third with serrate posterior edge; dactyls of pereopods 1-2 nearly as long as sixth articles; second articles of pereopods 3-4 very short, broad, posterior edges with 2-3 rather large serrations; second article of pereopod 5 intermediate in width, anterior and posterior edges parallel, posteroventral corner not lobate, bearing 2 large serrations; telson cleft about halfway.

Female. — Eyes small, about two thirds as broad as length of rostrum; antenna 1 of normal female configuration.

Holotype. — USNM No. 111546, male, 4.6 mm.

Type-locality. — BLA 124, 42 m, April 24, 1962.

Relationship. — This species is most similar to *Rhachotropis inflata* (Sars, 1895, pl. 152) but differs by (1) the absence of lateral carinae on pleonite 3 and the presence of 2 posterior cusps on the posterodorsal margin of each side; (2) the longer and more strongly deflexed rostrum; (3) the longer dactyls of the first 2 pairs of pereopods; (4) the very broad, short, second articles of pereopods 3 and 4 with their larger and less numerous teeth; (5) the small teeth on the unproduced posteroventral corner of the second article of pereopod 5; and (6) a greater disproportion between the lengths of the fourth and fifth peduncular articles of antenna 2. It resembles *R. oculata* (Hansen) (Gurjanova, 1951) in cephalic shape but differs by the absence of a dorsal tooth on pereonite 7 and pleonite 3, the absence of a tooth on the posteroventral corner of the second pleonal epimeron and the relatively parallel edges of the second article on pereopod 5.

No male accessory flagellum has been detected; a small, fused scale with setae is present on the mediodistal edge of article 3 of antenna 1; the female bears a uniarticulate accessory flagellum.

Records. — On silt bottom in 38-46 m; possibly represented by 1 specimen in "Velero" Sta. 5114, southern California (Allan Hancock Foundation).

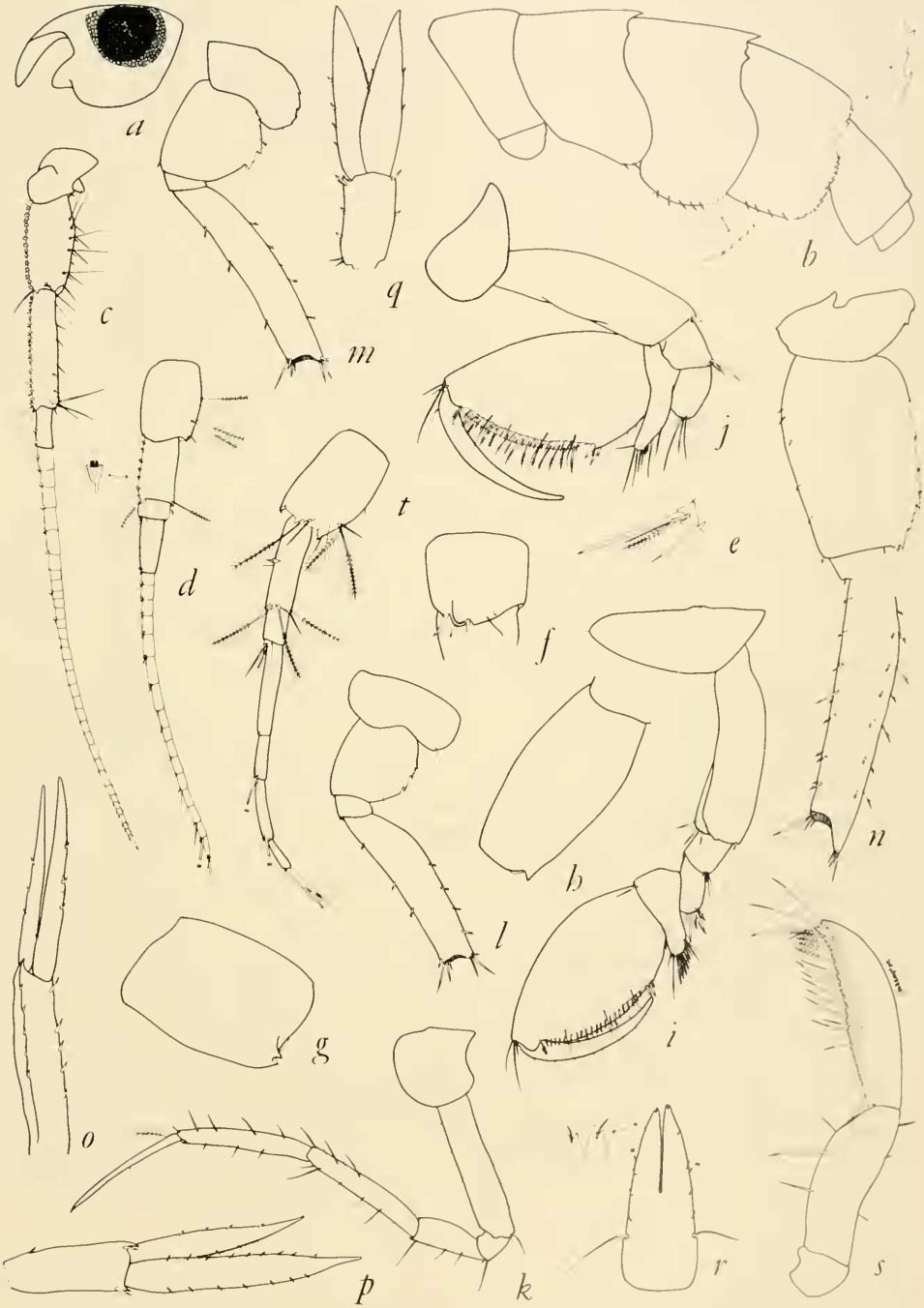

Figure 16. **Rhachotropis luculenta,** new species, male, 4.6 mm, BLA 124: a, head; b, pereonite 7 and pleonites 1-5, left side; c, d, antennae 2, 1; e, accessory flagellum; f, article 3 of antenna 1; g, article 1 of antenna 1; h, article 4 of antenna 2; i, j, gnathopods 1, 2; k, l, m, n, pereopods 1, 3, 4, 5; o, p, q, uropods 1, 2, 3; r, telson; s, mandibular palp. Female, BLA 95: t, antenna 1.

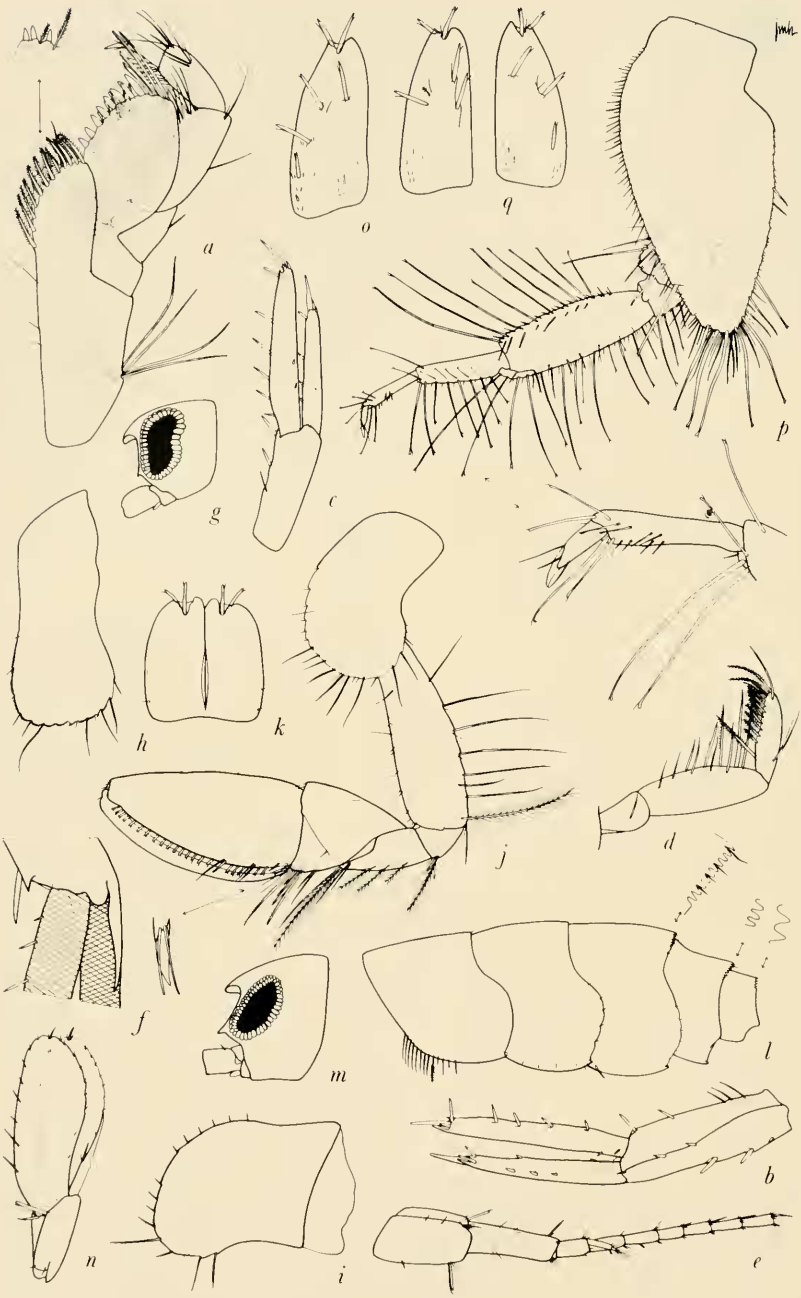

Figure 17. **Megaluropus longimerus falciformis**, new subspecies, female, 4.1 mm, BLA SIO-62-228: a, maxilliped; b, c, uropods 1, 2; d, mandibular palp; e, antenna 1; f, peduncular process of uropod 1. Male, 3.6 mm: g, head; h, i, coxae 1, 3; j, gnathopod 2. Female, 5.1 mm: k, telson; l, pleonites 1-5, left to right; m, head. Juvenile, 2.6 mm: n, uropod 3. *Megaluropus longimerus* Schellenberg, southern California, "Velero" station 5564, female, 6.5 mm: o, half of telson; p, pereopod 2. Female: 3.9 mm: q, both halves of telson.

Elasmopus rapax Costa

Elasmopus rapax Costa. Barnard, 1955a: 10-12, fig. 5 (with references); 1962b: 94-96, figs. 16, 17.
Elasmopus rapax mutatus Barnard, 1962b: 96-98 fig. 18.

One form of this species was reported by Barnard (1962b) from BLA but a second form occurs in SIO collections. It resembles a form from southern California (Barnard, in press) that has article 2 of pereopod 5 strongly crenellated posteriorly. A third form from Tiburón Island, near BLA, is also described by Barnard and an open-sea subspecies, *E. r. mutatus* occurs in southern California (Barnard, 1962b).

The second form from BLA is characterized as follows: pleonal epimeron 3 like that of *E. antennatus* and *E. holgurus* (see Barnard, 1962b), with smooth posterior margin and small tooth at posteroventral corner; accessory flagellum elongate, 2-articulate, article 2 minute; gnathopod 2 like that of *E. r. mutatus*, bearing one distal palmar process and one process in middle of palm as large as that of *E. r. rapax* of Barnard (1962b), but setae denser, invading palm halfway and hiding middle process, proximal palmar ridge and spine absent; telson short, truncate and heavily spined as in *E. holgurus* Barnard (1962b) and the crenellated form (Barnard, in press); uropod 3 short but inner ramus not shortened, outer ramus with 3 sets of marginal spines.

The wide variability in assortment of characters on accessory flagella, second gnathopods, fifth pereopods, third pleonal epimera, third uropods and telsons suggests that *E. holgurus* may be another phenotype of *E. rapax*.

Records. — Rocky intertidal of Vermilion Sea Field Station and barrier islands, to 24 m on barrier island reef.

Distribution. — Circumtropical, subtropical and in some temperate seas.

Maera inaequipes (Costa)

Maera inaequipes (Costa). Barnard, 1959a: 25-26, pl. 5.

The specimens correspond morphologically with those reported by Barnard (1959a) from Newport Bay, California. The question of the assignment of northeastern Pacific representatives to the European species remains open to further study.

Records. — Rocky intertidal of barrier islands.

Distribution. — Possibly circumtropical and warm-temperate in the intertidal.

Megaluropus longimerus falciformis, new subspecies

Figures 17, 18

Diagnosis. — Lateral cephalic lobe with sharp cusp anteriorly; posterior edges of pleonal epimera 1-3 strongly rounded, ending posteroventrally in small cusps, 2 and 3 sparsely serrate posteriorly; dorsal edges of pleonites 3, 4, 5 strongly serrate; coxae 1 and 2 longer than broad, coxae 2-3 reniform, curved posteriorwards, coxae 3-4 poorly setose, see drawings for sexual differences; article 4 of gnathopods in both sexes strongly produced distally and posteriorly, lobe of article 5 well-developed and directed somewhat distally in female, less strongly distinct from article 5 in male; long falciform spines on distal articles of all pereopods extraordinarily stout and distally blunt; second articles of pereopods 3-5 more slender than in southern California individuals; telson short, very broad, apices broad, nearly truncated, armed with long, stout blunt spines, telson extending only halfway along inner ramus of uropod 2.

Holotype. — USNM No. 111475 female, 4.1 mm.

Type-locality. — BLA SIO-62-228, W. shore of bay, south of village, debris of fish sample on cobble bottom, 2 m, April 24, 1962, coll. Dr. Carl L. Hubbs and party.

Relationship. — This subspecies differs from *M. l. longimerus* Schellenberg (as described from California by Barnard 1962b) in (1) the more strongly convex posterior edges of the pleonal epimera and their smaller posterodistal teeth; (2) the presence of a distinct cusp on the lateral cephalic lobes in both sexes; (3) the bluntness of the pereopodal spines; (4) the broader telson with longer, blunter distal spines; and (5) the poor setation of coxae 3 and 4.

Megaluropus longimerus was originally described from western Africa and its identification from the eastern Pacific Ocean is open to question on geographic grounds. If the taxon has subspeciated in a small geographic area then it may also be represented by different subspecies in California and Africa. The original description is sketchy and the material should be reevaluated in light of various characters differentiating the two Pacific subspecies. The telson and pereopod 2 of Californian material are reillustrated herein (fig. 17, o, p, q) for comparison of spines with specimens from BLA.

Distribution. — Lagos, Nigeria; eastern Pacific Ocean from Monterey Bay, California to Bahia de San Ramón, Baja California, 10-108 m.

Megaluropus visendus, new species

Figures 19, 20

Diagnosis. — Rostrum long, slender, acute, reaching nearly to end of article 1 of antenna 1, lateral cephalic lobes bulbously produced and broadly rounded; eyes large, filling lateral lobes; antennae slender in female, article 5 of second antennal peduncle much longer than article 4, accessory flagellum uniarticulate; male antenna 2 peduncular base inflated, densely setose; upper lip scarcely incised; inner plate of maxilla 1 with 1 stout distal seta and numerous, slender setules lining medial edge; article 4 of maxillipedal palp short, armed with 1 long stout spine and several setae; coxa 1 broad, anterior edge sinuous, with anterior concavity above anteroventral corner; coxa 2 much broader than 1, truncate and slightly concave on ventral edge; coxa 3 scarcely different from coxa 1 in size, anterodistal edge beveled; coxa 4 much larger

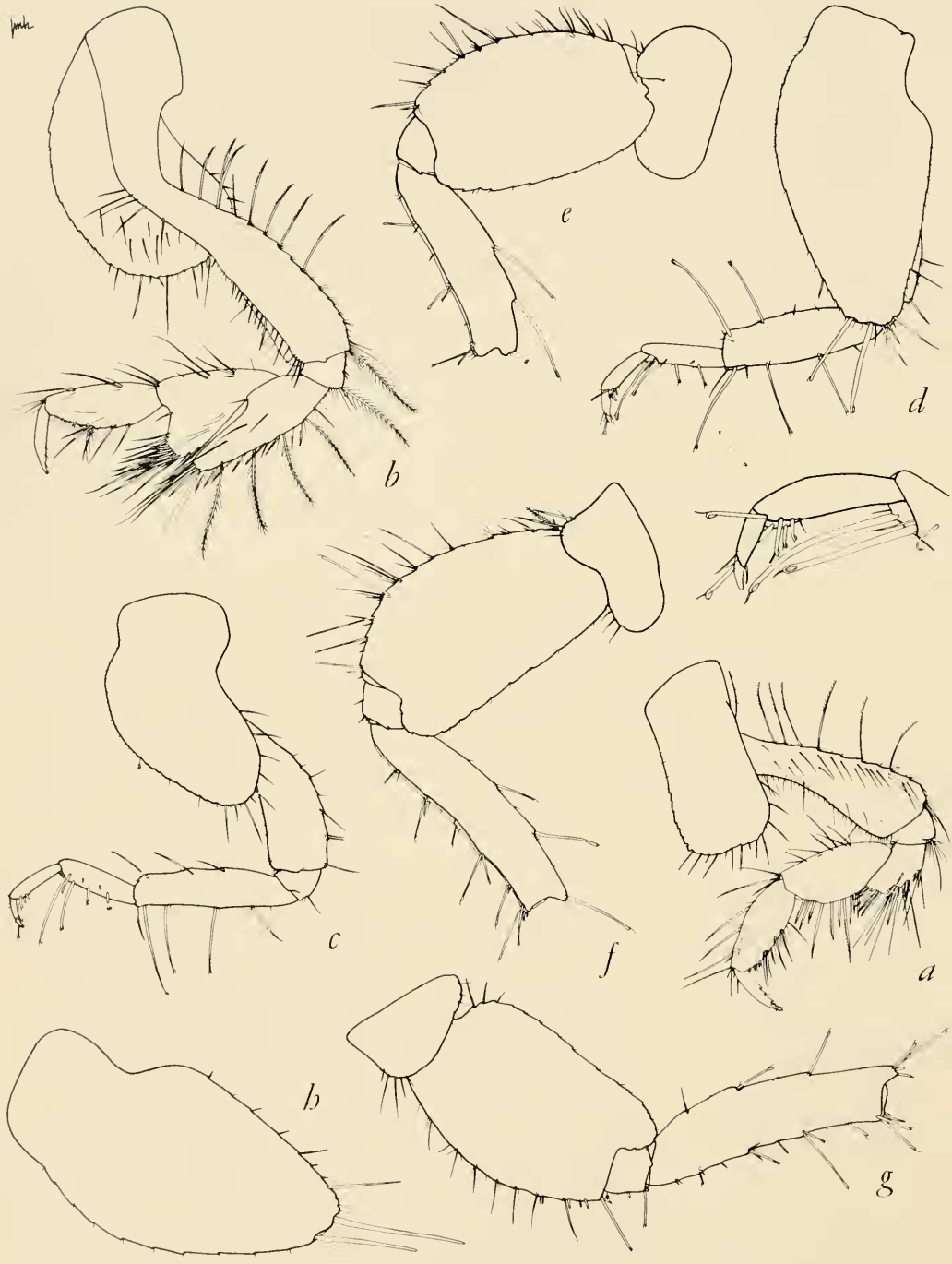

Figure 18. **Megaluropus longimerus falciformis**, new subspecies, female, 4.1 mm, BLA SIO-62-228: a, b, gnathopods 1, 2; c, d, e, f, g, pereopods 1, 2, 3, 4, 5. Male, 3.6 mm: h, coxa 4.

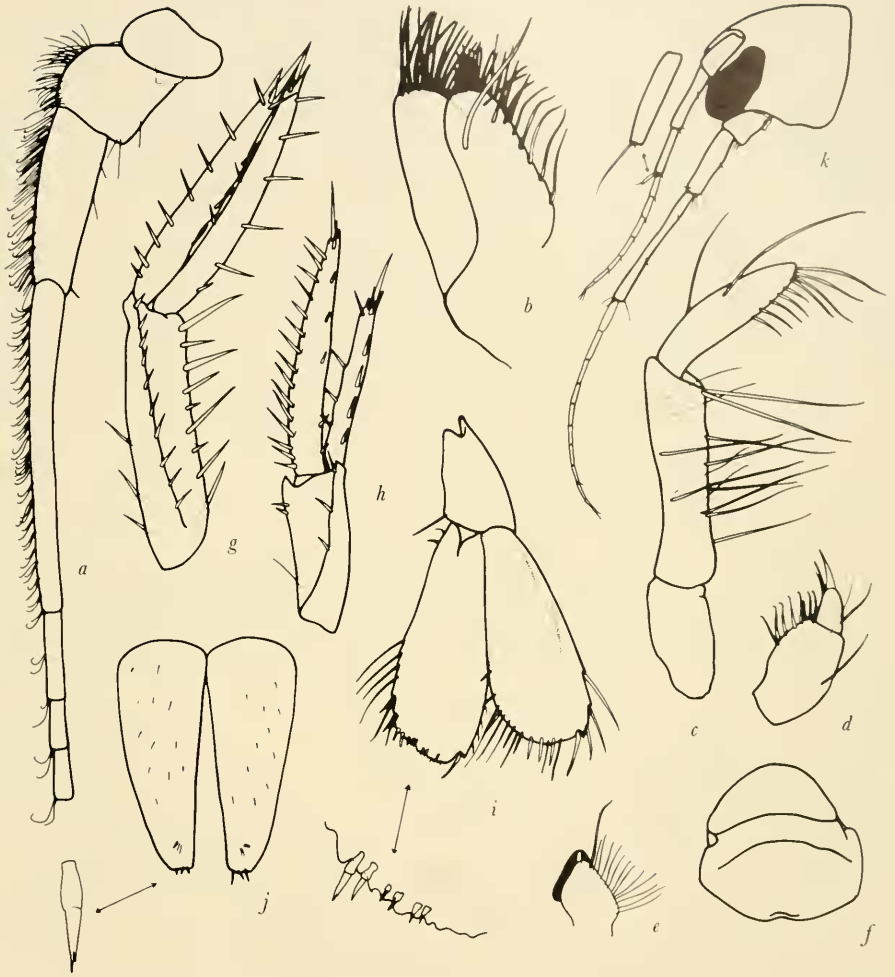

Figure 19. **Megaluropus visendus,** new species, male, 2.5 mm, BLA 9: a, antenna 2, flagellum cut after article 3; b, maxilla 2; c, mandibular palp; d, maxillipedal palp articles 3-4; e, inner plate of maxilla 1; f, upper lip. Female, holotype, 2.7 mm: g, h, i, uropods 1, 2, 3; j, telson; k, head.

than other coxae, evenly rounded below, not tapering; coxae 5-7 unusually long, coxa 5 with long anterior lobe projecting ventrally, coxa 6 with small anterior lobe projecting anteriorly, coxa 7 with anteroventral lobe; gnathopod 1 small, stout, simple, poorly setose, articles 4 and 5 rather bulbous, article 6 comparatively slender, dactyl armed with stout, partially fused, distal spine; gnathopod 2 of female with very slender second article bent proximally, article 4 small and not produced behind, article 5 triangular, long, with apex of triangle forming posterior process, article 6 linear, slender, simple, article 7 about two thirds as long as article 6, bearing 1 distal spine and several setules; gnathopod 2 of male with article 5 less triangular in shape, posterior process pointing distally, article 6 inflated but slender relative to article 5, tapering distally, without distinct palm, dactyl long, curved, about two thirds as long as palm and distally bearing fused spine without accessory setules; pereopod 2 longer than 1, but both otherwise similar, slender, article 6 shorter than 5; fifth articles of pereopods 3, 4 (? and 5), about half as long as fourth articles, these pereopods relatively shorter than in *Megaluropus agilis;* posterodorsal margins of pleonites 1 and 2 minutely serrate, segments 4 and 5 slightly elevated as in *M. longimerus* (as shown by Barnard, 1962b) and serrate; third pleonal epimeron evenly rounded behind, densely serrate, second pleonal epimeron subquadrate at posteroventral corner, with 2 distal serrations; first pleonal epimeron evenly convex behind, protuberant posteriorly, rounded-quadrate at ventral corner; telson long, reaching about to middle of rami of uropod 3, poorly armed.

Holotype. — USNM No. 111511, female, 2.7 mm.

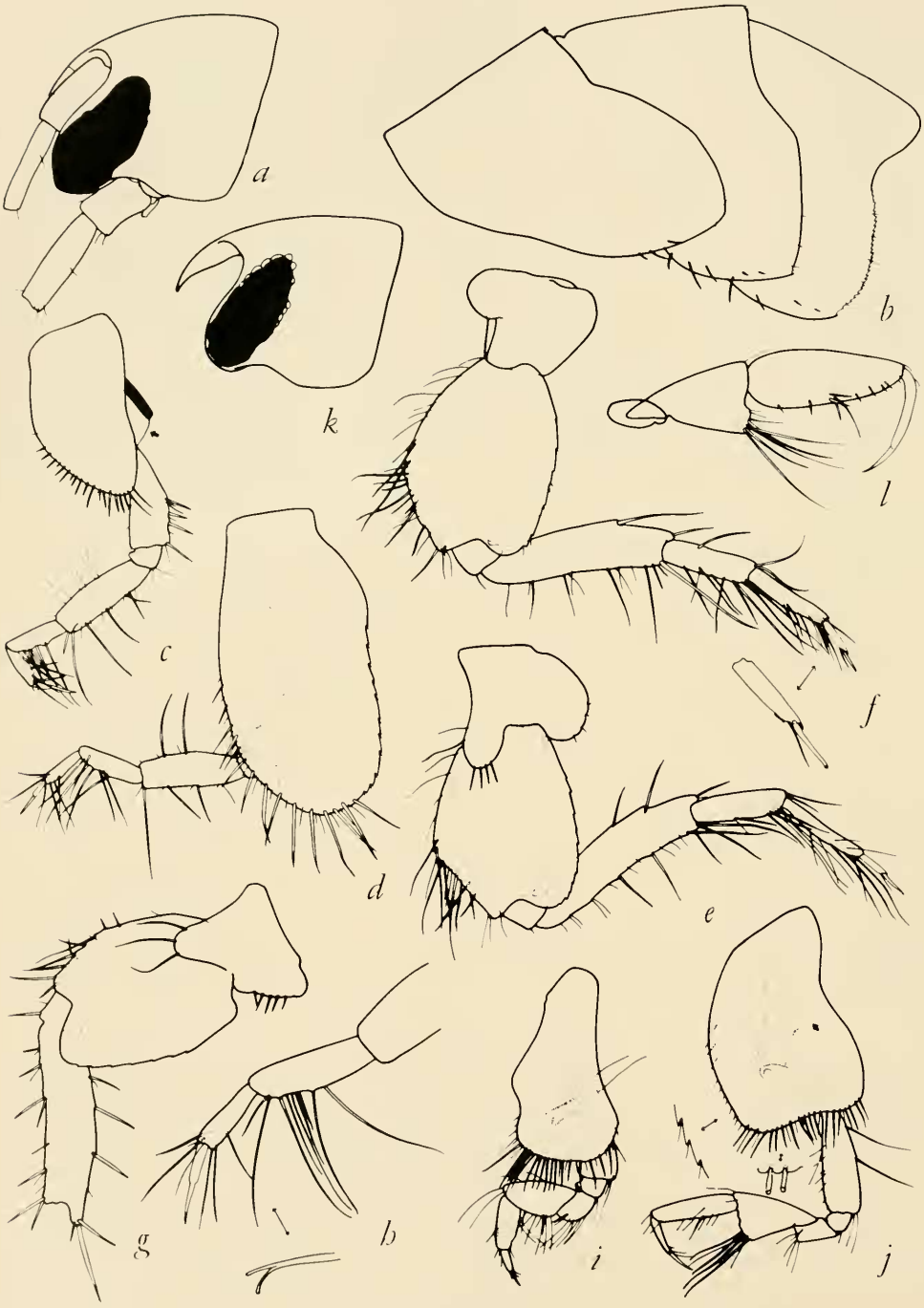

Figure 20. **Megaluropus visendus,** new species, female, 2.7 mm, holotype, BLA 9: a, head; b, pleonal epimera 1-3, left to right; c, d, e, f, g, pereopods 1, 2, 3, 4, 5; h, pereopod 2, enlarged; i, j, gnathopods 1, 2. Male, 2.5 mm: k, head; l, gnathopod 2. Arrows in figs. c and j indicate gill attachments.

Type-locality. — BLA 9, 2 m, October 31, 1963.
Relationship. — This species resembles *Megaluropus agilis* Hoek, as figured by Chevreux and Fage (1925) but has numerous small differences: (1) the rostrum is narrower, longer, and more discrete; (2) the heads of both sexes are similar and the eyes are of the same large size, in contrast to the small female eyes of *M. agilis;* (3) article 5 of second antennal peduncle is much longer than article 4; (4) the accessory flagellum is uniarticulate; (5) coxa 1 is broader and coxae 4-7 are longer and of different shapes than in *M. agilis;* (6) gnathopod 2 of the female is somewhat similar to that of *M. agilis* but article 5 is broader and article 6 more evenly slender; (7) gnathopod 2 of the male has article 5 much broader and with a distinct posterior lobe; (8) pereopods 3-5 are shorter and article 5 is much shorter than in *M. agilis.*

Dorsal serrations either occur or do not occur on pleonites 1-2 in the present material.

The gnathopodal differences of these two species indicate that the specimens identified by Barnard (1964a) as *M. agilis* are in reality a new species. That identification was based on a scant material with high variability but the following differences from *M. agilis* as figured by Chevreux and Fage (1925) now appear significant: (1) broader first coxa; (2) the distinctly triangular shape, posterior lobation and greater breadth of article 5 on male gnathopod 2 and the longer dactyl; (3) the more discrete rostrum of the male; (4) the distinctive female second gnathopod which is like the first gnathopod in the new species; but in *M. agilis* the first gnathopod has a broader fifth article with a distinctly subtriangular shape, whereas in *M. agilis* of Barnard the article is a linear trapezoid; (5) the uniarticulate accessory flagellum.

There are sufficient distinctions between the descriptions of *M. agilis* by Chevreux and Fage (1925) and by Pillai (1957) to suggest that the latter Indian material is also a new species.
Records. — Ranging in depth from 2 to 17 m on coarse to fine sand.

Melita sulca (Stout)

Caliniphargus sulcus Stout, 1913: 641-642.

Shoemaker (1941) relegated this species to *Melita palmata* (Montagu) but unlike that species, at least as figured by Sars (1895), the second urosomal segment of *Melita sulca* bears two pairs of small cusps, each pair embracing a seta, whereas *M. palmata* has a single dorsolateral cusp on each side.
Records. — Rocky intertidal to 24 m in the offshore islands and north of the village sandspit.
Distribution. — Southern California intertidal.

Meximaera, new genus

Diagnosis.— Antenna 1 with 4-articulate accessory flagellum; article 2 of mandibular palp longer than either articles 3 or 1, article 3 slender, linear (not falcate); lower lip bearing inner lobes; inner plate of maxilla 1 setose only terminally; inner plate of maxilla 2 scarcely setose on medial edge, considered primarily to be setose terminally; article 4 of maxillipedal palp not claw-shaped, short, bearing several long, distal spine-setae; gnathopods small but distinctly subchelate; uropod 3 with subequal rami, outer minutely biarticulate; telson cleft.
Type-species. — **Meximaera diffidentia,** new species.
Relationship. — Differing from *Maera* Leach by the short, non-unguiform article 4 of the maxillipedal palp and the strongly biarticulate outer ramus of uropod 3. The general aspect of *Meximaera* resembles that of *Maeracunha* Stephensen (1949), from Tristan da Cunha. The two genera have truncate antero-lateral cephalic margins and biarticulate outer rami of uropod 3, but *Meximaera* differs from *Maeracunha* in the poorly or non-setose medial edges of the inner lobes of both pairs of maxillae. *Meximaera* differs from *Maeropsis* Chevreux (1927) and *Paraceradocus* Stebbing (see 1906) in the poorly setose medial edge of maxilla 2 and the biarticulate outer ramus of uropod 3. The above-two genera may be synonymous. *Maerella* Chevreux (1911) has a triarticulate maxillipedal palp.

This genus appears to be a derivative of the *Maera*-line with the retention (primitive) of a second article on the outer ramus of uropod 3 and the rare occurrence of a shortened fourth maxillipedal palp article.

Meximaera, like *Linguimaera* Pirlot (1936), has the anteriorly lobate lip which also is common to several species of *Maera* and caused Schellenberg (1938) to synonymize *Linguimaera* with *Maera.* The identifications of *M. othonides* Walker (1904), the type-species of *Linguimaera,* are confused. Pirlot (1936) discounted Chilton's (1921) and K. H. Barnard's (1935) identifications and Nayar (1959), who did not cite Pirlot (1936), has identified material with *M. othonides* which fails to correspond with Pirlot's. Until valid specimens of Walker's species can be reexamined minutely for a second article on the outer ramus of the third uropod and for its maxillipedal palp article 4, there remains the possibility that *Meximaera* and *Linguimaera* are synonymous. If so, *Linguimaera* should be revived and take precedence over *Meximaera.*

Meximaera diffidentia, new species
Figures 21, 22

Diagnosis. — With the characters of the genus.
Notes. — The sides of the head are almost without lobular differentiation. The dactyls of the pereopods are complexly armed (see figures). Article 1 of antenna 1 has a ventral, proximal spine. The medial palmar surface of gnathopod 2 has not only a pair of marginal defining spines but a large submarginal spine dominating the palm. Female unknown.

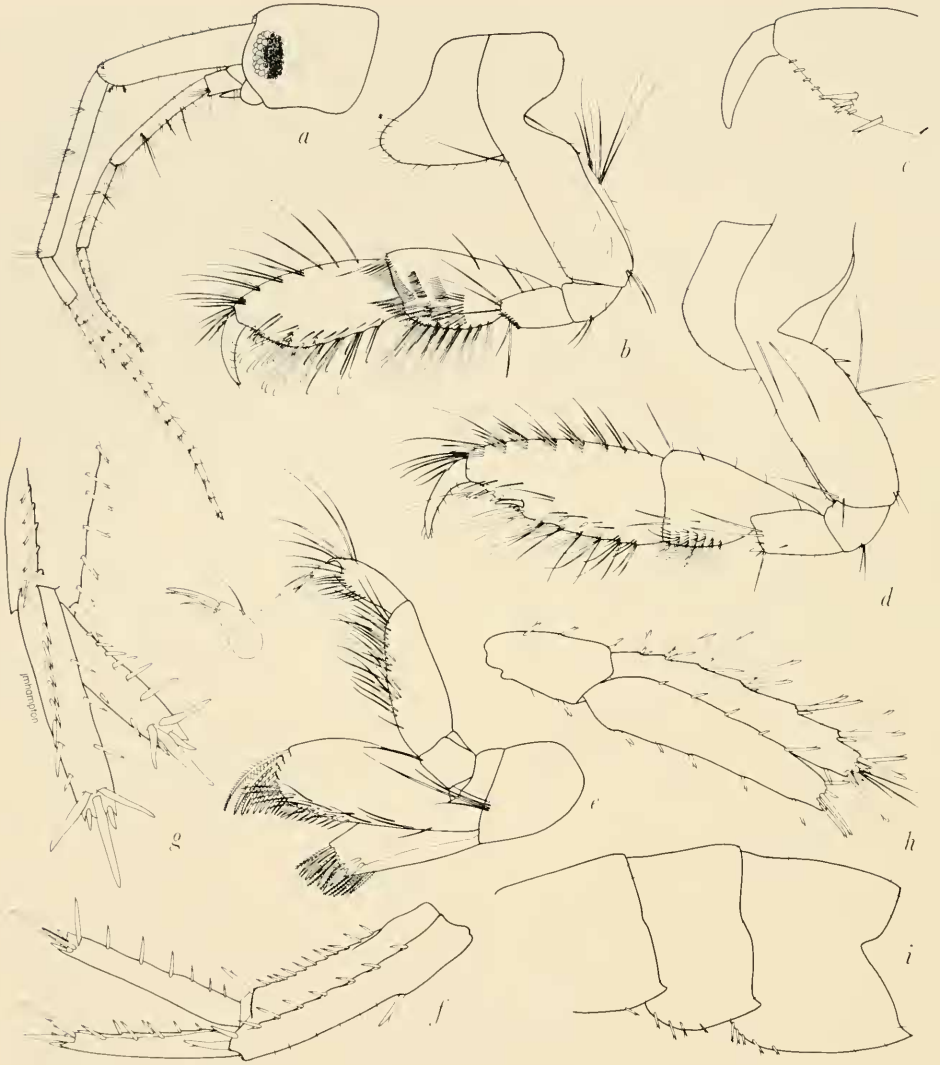

Figure 21. **Meximaera diffidentia,** new genus, new species, male, holotype, 5.8 mm, BLA SIO-62-216: a, head; b, c, gnathopod 1, lateral and medial views; d, gnathopod 2; e, maxilliped; f, g, h, uropods 1, 2, 3; i, pleonal epimera 1-3, left to right.

Holotype. — USNM 111497, male, 5.8 mm.
Type-locality. — BLA SIO-62-216, reef between Isla Ventana and Isla Cabeza de Caballo, shore, tailings of fish sample, April 21, 1962, Dr. Carl L. Hubbs and party, coll.
Records. — Rocky intertidal to 24 m in the offshore islands.

Family Haustoriidae

Platyischnopus metagracilis Barnard

Platyischnopus metagracilis Barnard, 1964a: 225-226, fig. 3.
Records. — Ranging in depth from 13 to 46 m, more abundant in 20-46 m, frequency in April in latter depths is 170 individuals/m^2, in October, 26/m^2.
Distribution. — Punta Canoas to Bahía de San Cristóbal, Baja California, 30-73 m.

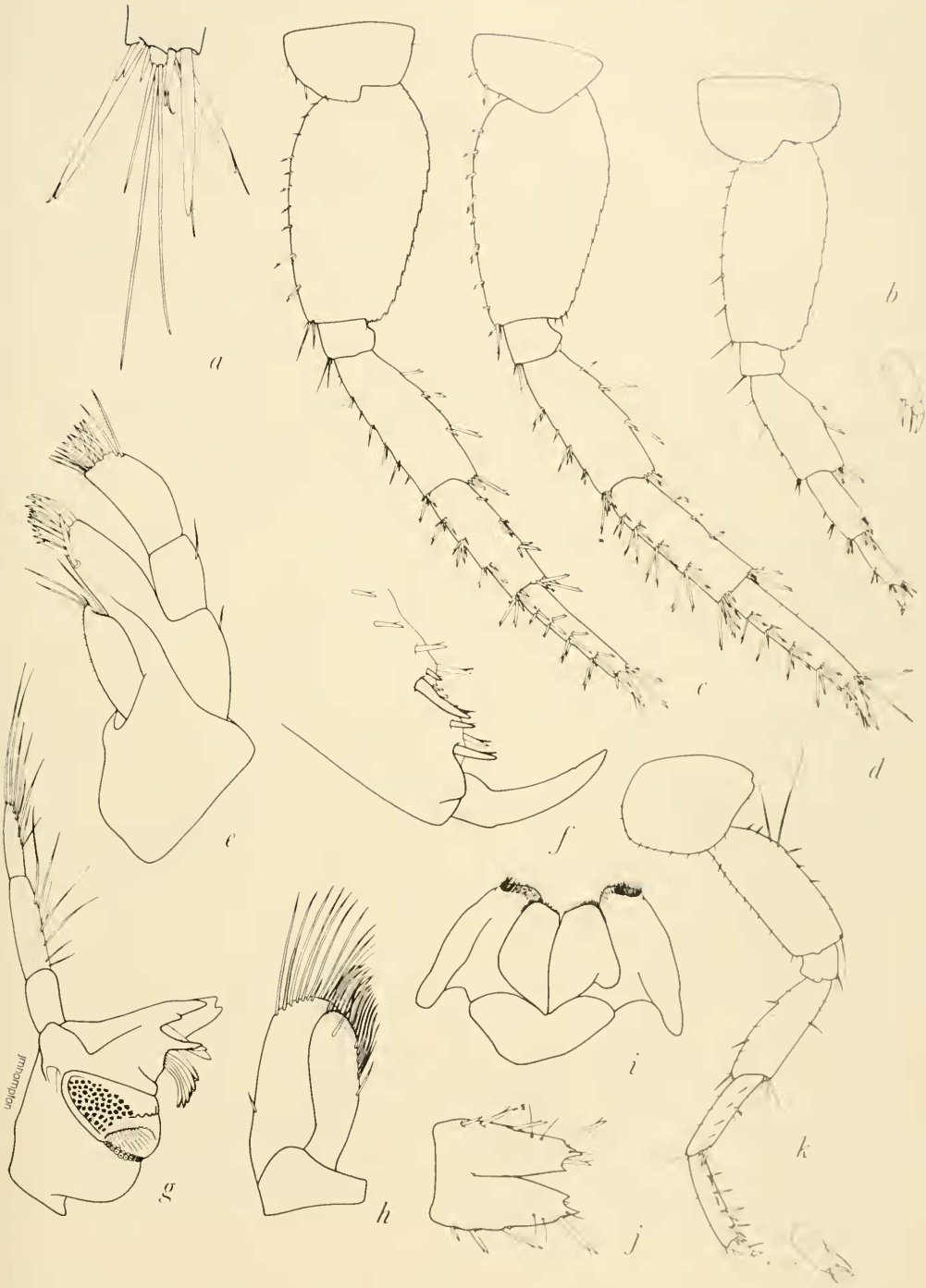

Figure 22. Meximaera diffiidentia, new genus, new species, male, holotype, 5.8 mm, BLA SIO-62-216: a, tip of outer ramus of uropod 3 showing article 2; b, c, d, pereopods 3, 4, 5; e, maxilla 1; f, gnathopod 2, medial surface of palm; g, mandible; h, maxilla 2; i, lower lip; j, telson; k, pereopod 1.

Platyischnopus viscana Barnard

Platyischnopus viscana Barnard, 1964a: 226, fig. 4.
Record. — Rocky intertidal of offshore islands.
Distribution. — La Jolla, California to Bahía Magdalena, Baja California, 17-27 m.

Family Hyalidae

Hyale rubra frequens Stout

Allorchestes frequens Stout, 1913: 650-651.
Hyale rubra (Thomson). Hurley, 1957: 910-913, figs. 30-50.
Hyale nigra (Haswell). Barnard, 1962c: 153-156, figs. 19, 20.
Hyale rubra frequens Barnard (in press).

Specimens from BLA have the elongate antennae typical of specimens from Bahía de San Quintín (Barnard, 1964b) and the setae on the posterior edge of the hand on male gnathopod 1 are widely spread; they occupy 30 percent of the marginal length.
Records. — Rocky intertidal to 7 m.
Distribution. — California and Baja California, intertidal.

Family Isaeidae (=Photidae)

Amphideutopus oculatus Barnard

Amphideutopus oculatus Barnard, 1959a: 34-35, pl. 10; 1961: 181, fig. 2; 1964a: 236; 1964b: 110, chart 15.
Records. — Rocky intertidal of offshore islands; 9-16 m in dredge haul; all other samples in depths of 22-41 m primarily on brown silty sands.
Distribution. — Pt. Conception, California to Bahía de San Cristóbal, Baja California, 2-162 m.

Eurystheus thompsoni (Walker)

Eurystheus tenuicornis var. *lobata* Shoemaker, 1942: 28, fig. 10 a-c.
Eurystheus thompsoni Shoemaker, 1955: 59.

Gnathopod 1 is typical of var. *lobata,* having the large, posterior, setose lobe on article 2.
Record. — Rocky intertidal of offshore islands.
Distribution. — Bahía Magdalena, Baja California (*lobata* variety).

Eurystheus tonichi, new species

Figure 23

Diagnosis. — Similar to *E. thompsoni* (Walker) (see Shoemaker, 1931, 1942, 1955) and in male undergoing similar radical transformation of gnathopod 2 and coxa 7; following characters similar to *E. thompsoni:* eyes and head, with slight anterior cusp on sharp lateral cephalic lobe; epistome strongly produced and acute, other mouthparts similar but setules on inner plate of first maxilla vrey fine; pleonal epimera 1-3 with tooth at posteroventral corners, third with very convex, nearly subacute, posterior edge (male holotype slightly aberrant, other specimens like Shoemaker, 1931, figure 4a); pleonites 4-5 with pairs of dorsolateral teeth similar to *E. thompsoni;* uropods similar, rami of uropod 3 slightly longer than peduncle, uniarticulate, inner slightly longer than outer; telson strongly excavate posteriorly, each lobe armed with 1 spine and setules. Characters distinct from *E. thompsoni:* gnathopod 1 with article 6 stouter, more inflated; fully adult male gnathopod 2 with palm and posterior margin of article 6 confluent, simple, distal end of palm with single cusp, dactyl folding halfway along posterior margin of article 6; young male gnathopod 2 similar to young male of *E. thompsoni* (compare fig. 23k herein and fig. 3a of Shoemaker, 1931).

Most of the specimens have lost pereopods 3-5 but this does not detract from the several specific characters distinguishing this species from *E. thompsoni.* Pereopods 4-5 of the holotype and of a young male are very small and may be regenerate. Article 2 of pereopod 4 on the young male is narrow and posteriorly sinuous.

Female almost identical with that of *E. thompsoni,* specimens from California being compared with those of Bahía de Los Angeles (figures 23 n, o herein for gnathopod 2).
Holotype. — USNM No. 111472, male, 5.3 mm.
Type-locality. — BLA 212, west shore of Bahía de Los Angeles, west of Isla Ventana, dredge of *Ulva* and gracilarioids, sand bottom, 9-16 m April 28, 1962.
Relationship. — Differs conspicuously from *E. thompsoni* by the simple palm of the terminal adult male, having a single cusp; in *E. thompsoni* the palm is distally subtransverse, short and armed with 2 cusp-teeth, one of them defining the palm. Pereopod 3 of *E. tonichi* apparently does not differ from that of *E. thompsoni* except by the slightly broader article 2.
Records. — Rocky intertidal to 38 m on shell sands.

Photis ?bifurcata Barnard

?Photis bifurcata Barnard, 1962a: 30-31, fig. 10; 1964a: 240.

Specimens are subadult but presumably represent this unusual species.
Records. — Ranging in depth from 38 to 46 m.
Distribution. — Monterey Bay, California to Bahia de San Cristóbal, Baja California, 11-93 m.

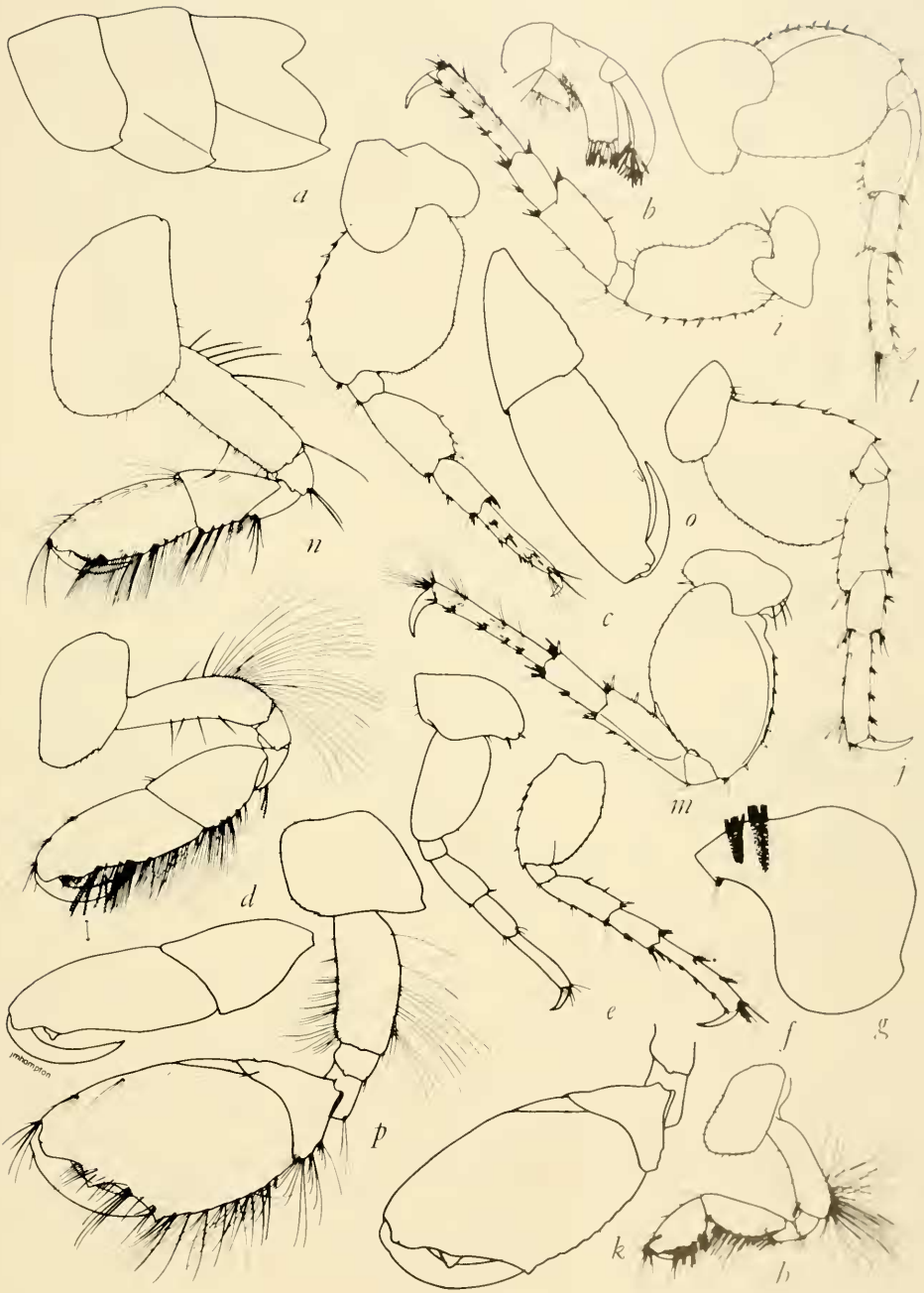

Figure 23. **Eurystheus tonichi,** new species, male, 5.3 mm, BLA 212: a, pleonal epimera 1-3, left to right; b, maxilla 1; c, pereopod 3; d, gnathopod 2, 2 views; e, f, pereopods 4, 5; g, coxa 7; h, gnathopod 1. Male, 4.5 mm, BLA SIO-62-215: i, j, pereopods 4, 5; k, gnathopod 2, lateral view minus setae. Male, 5.4 mm, BLA 212: l, m pereopods 3, 4. Female, 6.3 mm, BLA 212: n, o, gnathopod 2, 2 views. Male, 5.4 mm, BLA SIO-62-215: p, gnathopod 2, lateral.

Photis brevipes Shoemaker

Photis brevipes Shoemaker, 1942: 25-27, fig. 9. Barnard, 1962a: 31-33, fig. 11; 1964a: 240-241.

The two adult males of BLA 25 (3.0 mm) have the inner protuberance on article 7 of gnathopod 2 smaller and more proximal than in Californian specimens.

Records. — Ranging in depth from 9 to 36 m.

Distribution. — Coos Bay, Oregon to Bahía Magdalena, Baja California, 0-135 m.

Photis californica Stout

Photis californica Stout. Barnard, 1962a: 33-36, figs. 12, 13; 1964a: 241.

The male of BLA 144 (3.0 mm) has a well-developed lobe on article 2 of gnathopod 1, and the palm of the hand, similar to the female second gnathopod, is more excavate than in specimens from California.

Records. — Ranging in depth from 34 to 46 m.

Distribution. — Monterey Bay, California to Bahía de San Cristóbal, Baja California, 10-139 m.

Family Ischyroceridae

Jassa falcata (Montagu)

Jassa falcata (Montagu). Sexton and Reid, 1951: 30-47, pls. 4-30. Barnard, 1959a: 37; 1964b: 118.

Records. — Ranging in depth from 7 to 18 m.

Distribution. —Cosmopolitan in shallow waters and intertidal zones, especially in harbors on pilings.

Microjassa macrocoxa Shoemaker

Microjassa macrocoxa Shoemaker, 1942: 44-47, figs. 16, 17.

Records. — Rocky intertidal to 38 m, most abundant in shallow water dredge hauls.

Distribution. — Bahía Magdalena, Baja California, 18-27 m.

Family Leucothoidae

Leucothoe alata Barnard

Leucothoe alata Barnard, 1959a: 19-20, pl. 1; 1962c: 132, figs. 7 D, E, F; 1964a: 227.

Records. — Rocky intertidal of Vermilion Sea Field Station.

Distribution. — Monterey Bay, California to Bahía de San Ramón, Baja California, 0-24 m.

Family Liljeborgiidae

Liljeborgia marcinabrio, new species

Figure 24

Diagnosis. — Lateral cephalic lobes obtuse, strongly projecting; eyes large but poorly pigmented, ommatidia sparse; mandibular palp article 2 not exceeding article 1 in length; coxa 1 barely expanded distally, coxa 2 strongly beveled anterodistally, coxa 4 sparsely serrate posteriorly, corner at excavation rounded, not sharp; article 4 of both gnathopods acutely produced and slightly attenuate; dactyls of gnathopods 1 and 2 with 4 and 7 teeth on respective inner edges; serrations on second articles of pereopods 3-5 strongly demarcated; both margins of both rami of uropod 3 spinose; telson with apices of each lobe very deeply incised, resulting pair of cusps asymmetrical; posterodorsal edges of pleonites 1-2 each with 3 teeth, of pleonites 4-5 each with one large, posteriorly directed tooth, pleonite 3 lacking dorsal teeth; pleonal epimera 1 and 2 each with posteroventral tooth, third epimeron with bifid tooth.

Holotype. — USNM No. 111504, female, 5.4 mm. Unique.

Type-locality. — BLA 138, 46 m, April 22, 1962, brown silt.

Relationship. — This species, having the aspect of *Liljeborgia kinahani* (Bate) (see Sars 1895: pl. 188, fig. 1), differs by the larger, poorly pigmented eyes, the strongly spinose rami of uropod 3, the bifid tooth of pleonal epimeron 3, the slightly more expanded first coxa but more strongly beveled second, by the rounded cephalic lobe and the larger, less disproportionate teeth of pleonites 4-5.

In terms of dorsal pleonal tooth-formulas this species has the following relatives, each of which is listed with its distinctions: *L. aequabilis* Stebbing (in Hurley, 1954) has a single posteroventral tooth on the third pleonal epimeron, less strongly notched telsonic apices, a denser comb of spines on article 6 of pereopods 1-2, a smooth posterior edge of coxa 4; *L. akaroica* Hurley (1954) has a single tooth on the posteroventral corner of the third pleonal epimeron, and larger teeth on pleonites 4-5; *L. longicornis* (Schellenberg, 1931) has only a simple notch on the third pleonal epimeron and a broadly expanded first coxa, its peculiar dactyl of pereopod 5 not being compared to the new species because of the loss of pereopods in the unique specimen; *L. macrodon* Schellenberg (1931) again has the simply-notched third pleonal epimeron and obsolescent medial cusps of the telsonic apices; both *L. mixta* Schellenberg (1925) and *L. octodentata* Schellenberg (1931) differ from *L. marcinabrio* by their simple third epimeral tooth and sinus.

Liljeborgia marcinabrio bears a remarkable resemblance to *L. hansoni* Hurley (1954), from New Zealand, in pleonal epimera, telson, pereopods, and except for pleonite 1, the dorsal sculpture. Pleonite 1 of *L. hansoni* has only a single medial tooth. Its second mandibular palp article is longer than the first.

Listriella melanica lazaris, new subspecies

Figure 26 c-g

References to the nominate subspecies are as follows: Barnard, 1959b: 16-18, figs. 1, 2; 1964a: 229; 1964b: 108, chart 8.

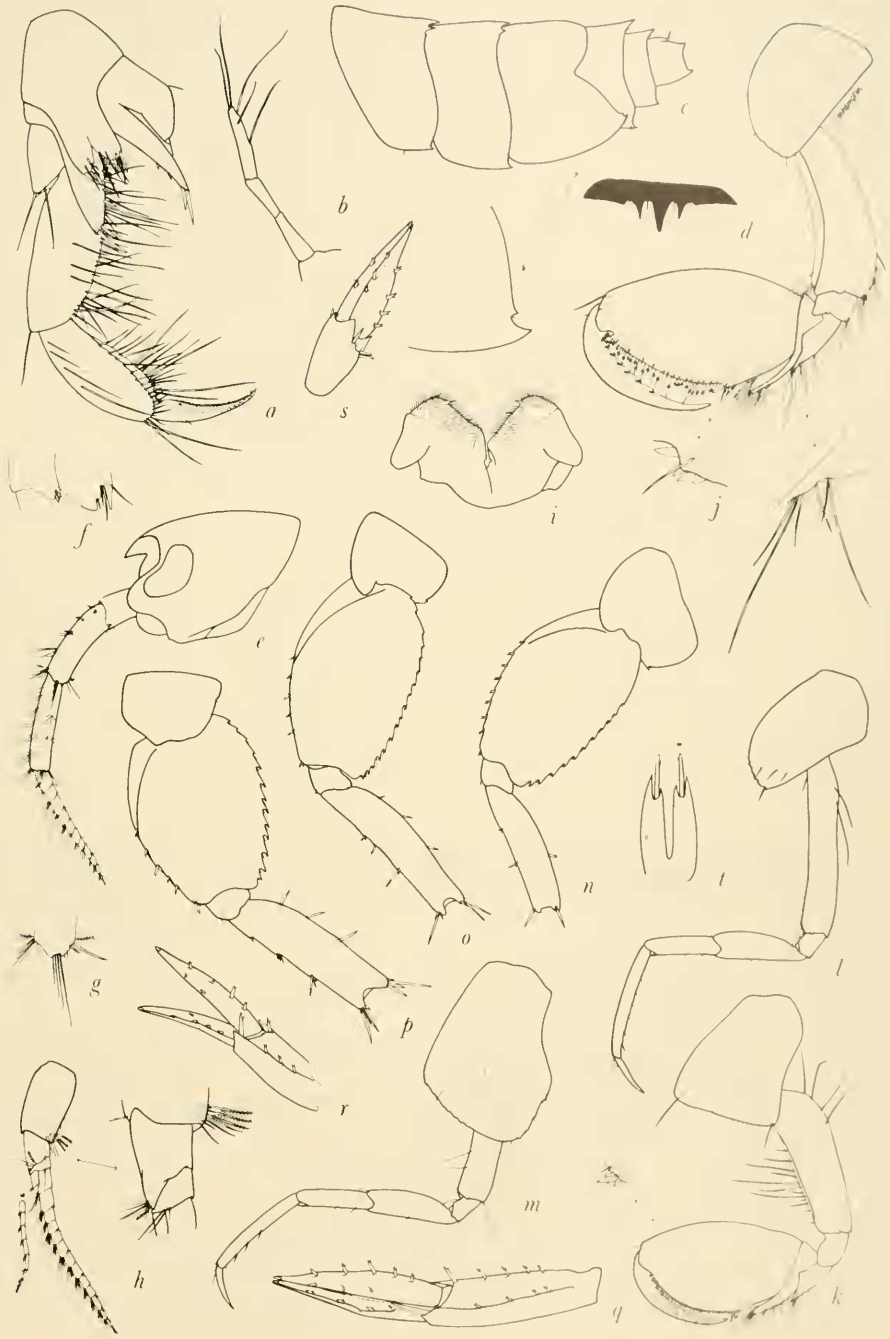

Figure 24. **Liljeborgia marcinabrio,** new species, female, 5.4 mm, BLA 138: a, maxilliped; b, mandibular palp; c, pleon; d, dorsum of pleonites 1-2 (a single example); e, head; f, end of article 3 of antenna 2, 2 views; g, end of article 4 of antenna 2; h, antenna 1; i, lower lip; j, k, gnathopods 2, 1; l, m, n, o, p, pereopods 1, 2, 3, 4, 5; q, r, s, uropods 1, 2, 3; t, telson.

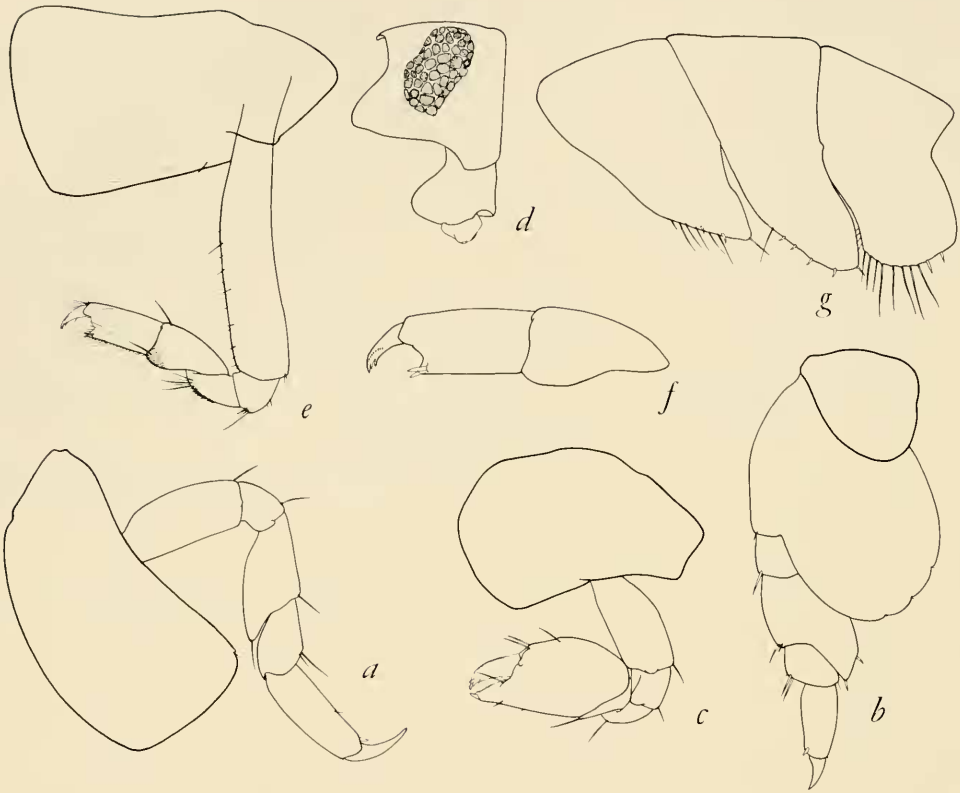

Figure 25. **Pachynus barnardi** Hurley, female 1.8 mm, BLA 97: a, b, pereopods 1, 5; c, gnathopod 1. *Orchomene magdalenensis* (Shoemaker), male, 3.7 mm, BLA 142: d, head; e, f, gnathopod 1. *Polycheria osborni* Calman, ovigerous female, 5.6 mm, BLA 214: g, pleonal epimera 1-3, left to right.

Diagnosis. — Female differing from female of nominate subspecies by distally expanding sixth article of gnathopod 1; this structure is similar in males of both subspecies.
Holotype. — USNM No. 111481, female, 3.2 mm.
Type-locality. — BLA 132, 25 m, April 22, 1962, bottom of shell sand.
Records. — Ranging in depth from 7 to 44 m; generally more abundant between 13 to 40 m; frequency of 39 individuals/m^2 in latter depths in April.
Distribution of *L. m. melanica*. — Pt. Conception, California to Bahía de San Cristóbal, Baja California, 12-97 m in the open-sea, 2-3 m in Bahía de San Quintín.

Family Lysianassidae

Hippomedon ?propinquus Sars

Figure 7 k, l, m, n

?Hippomedon propinquus Sars, 1895: 57, pl. 21, fig. 1. Gurjanova, 1962: 107-111, figs. 24-26 (with references). Barnard 1964b: 80-82 (as *H. denticulatus* and *H. propinquus*).

These subadult specimens lack the notch on pleonal epimeron 3 characteristic of the *H. denticulatus* group of species but Barnard (1964b) has presented evidence questioning that character as specifically significant. The specimens from BLA differ from *H. p. propinquus* in Gurjanova (1962) in the non-chelate palm of gnathopod 2 (fig. 7 k, l) and in this character the specimens resemble those from southern California and Bahía de San Quintín. Gnathopod 2 of BLA specimens differs from *H. p. sibiricus* in the shape of the palm and the short curved dactyl. Article 1 of the flagellum on antenna 1 is shortened (fig. 7n) in contrast to *H. p. sibiricus* Gurjanova (1962) and *H. p. propinquus*.
Records. — Ranging in depth from 15 to 30 m on silt and coarse sand.
Distribution. — The species occurs throughout the subarctic and boreal regions.

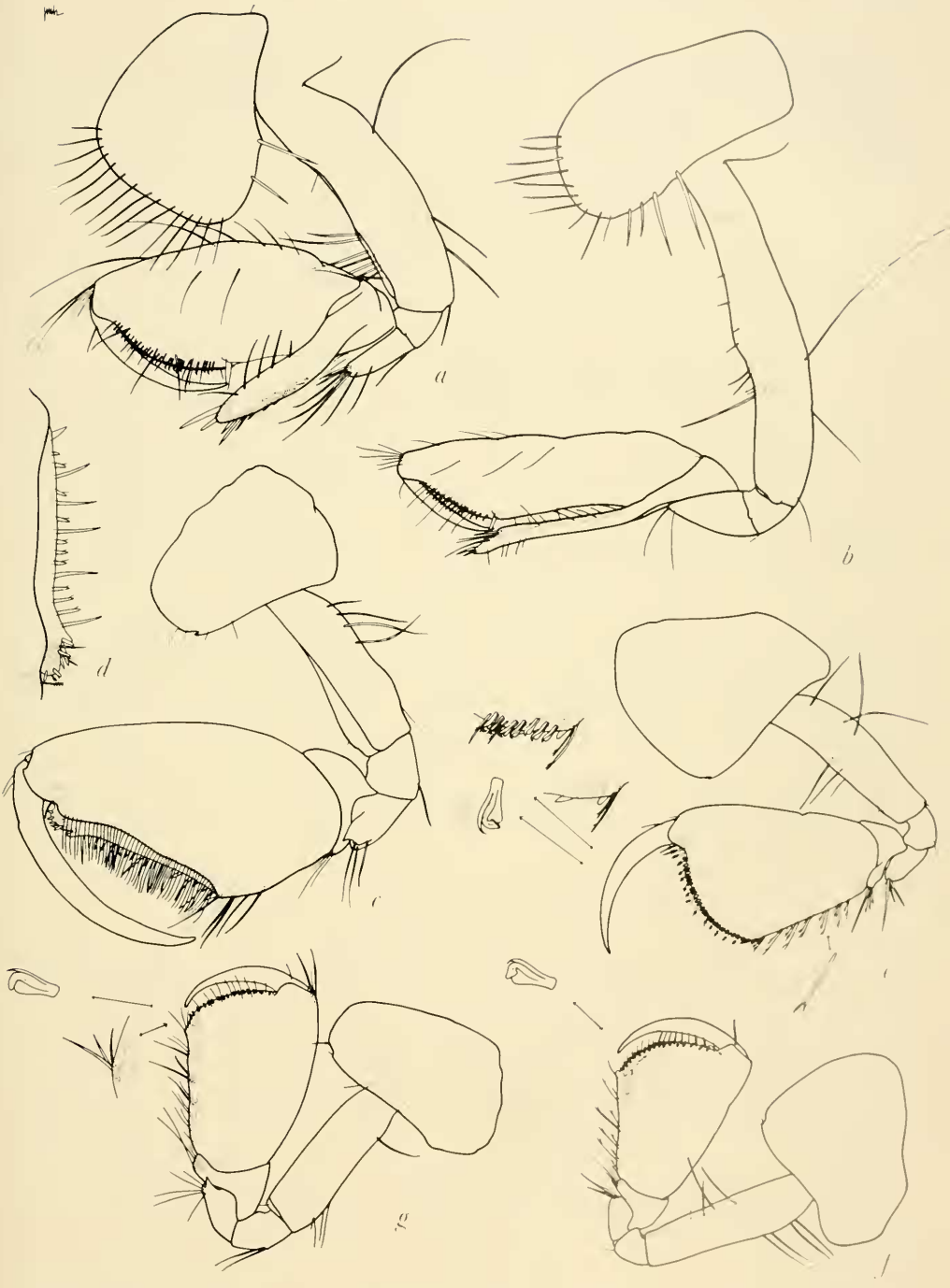

Figure 26. *Monoculodes hartmanae* Barnard, female, 4.6 mm, BLA 55: a, b, gnathopods 1, 2. *Listriella melanica lazaris* Barnard, new subspecies, male, 3.6 mm, BLA 132: c, gnathopod 2; d, palm of gnathopod 2; e, gnathopod 1 with offset spines and portion of palm. Female, 3.2 mm: f, g, gnathopods 1, 2.

Lysianassa dissimilis (Stout)

Nannonyx dissimilis Stout, 1913: 638-639.
Aruga dissimilis. Shoemaker, 1942: 7, fig. 2. Barnard, 1955b: 100-103, pl. 29, figs. g, i.
Lysianopsis dissimilis. Hurley, 1963: 76-77, fig. 21d.
Lysianassa dissimilis. Barnard (in press).
Record. — Rocky intertidal, island reef.
Distribution. — Coast of California from Tomales Bay to Isabel Island, México and the Galápagos Islands, 0-73 m.

Lysianassa macromerus (Shoemaker)

Aruga macromerus Shoemaker, 1916: 157-158.
Lysianopsis macromerus Hurley, 1963: 77.
Lysianassa macromerus Barnard (in press).
Record. — Rocky intertidal, Vermilion Sea Field Station.
Distribution. — Intertidal of southern California.

Orchomene magdalenensis (Shoemaker)

Figure 25 e, f

Orchomenella magdalenensis Shoemaker, 1942: 4-7, fig. 1.
Orchomene magdalenensis. Barnard, 1964a: 231-232; 1964b: 95, fig 12.

The male has a large, projecting, lateral cephalic lobe like that of the female, in contrast to the male described by Barnard (1964b) from Bahía de San Quintín. The first gnathopod of the male but not the female is strongly excavate in contrast to both Barnard's and Shoemaker's drawings (see figure herein). The female from Bahía de Los Angeles has the fourth pleonite similar to that of males, unlike outer-coast specimens.
Records. — Ranging in depth from 6 to 46 m.
Distribution. — Bahía de San Ramón to Bahía Magdalena, Baja California, 2-11 m.

Pachynus barnardi Hurley

Figure 25 a-c

Pachynus barnardi Hurley, 1963: 31-25, figs. 6, 7.

Only a few small specimens, approximately 1.8 mm in length have been collected in this survey. These differ from the original description in the stouter and shorter sixth articles of pereopods 3-5 and the somewhat stouter and shorter fifth article of gnathopod 2.
Records. — Ranging in depth from 30 to 46 m.
Distribution. — Monterey Bay, California to Bahía de San Ramón, Baja California, 12-183 m.

Uristes entalladurus Barnard

Uristes enalladurus Barnard, 1963: 460-462, figs. 5, 6; 1964b: 100.

The third pleonal epimeron is somewhat more quadrate and article 5 of gnathopod 2 more bulbous than in specimens from southern California.
Record. — Silty sand, 38 m.
Distribution. — Port Hueneme, California to Bahía de San Quintín, Baja California, 2-18 m.

Family Oedicerotidae

Monoculodes hartmanae Barnard

Figure 26 a, b

Monoculodes hartmanae Barnard, 1962d: 363-365, figs. 5-7.

Although *Monoculodes nyei* Shoemaker (1933a and see Barnard, 1962d) was expected from Bahía de Los Angeles, because of its occurrence at San Felipe to the north of Bahía de Los Angeles, all of the specimens of the genus collected in the latter bay belong to *M. hartmanae*, as shown in the accompanying drawings of gnathopods 1 and 2.
Records. — Rocky intertidal to 41 m but generally better represented between 13 and 38 m; frequency in the latter depths in April is 51 individuals/m^2.
Distribution. — Pt. Conception, California to Bahía de San Quintín, Baja California, about 2 to about 146 m but scarce in waters deeper than 37 m.

Synchelidium rectipalmum Mills

Synchelidium rectipalmum Mills, 1962: 17-19, figs. 5, 6B.
Records. — Rocky intertidal to 24 m on coarse substrate.
Distribution. — British Columbia to Costa Rica (specimens at hand), intertidal to 100+ m.

Synchelidium sp. G

This apparently new species is filed in Hancock and Smithsonian collections with this label; a study of this genus is in preparation.
Records. — Ranging in depth from 42 to 46 m.
Distribution. — Coastal shelf of southern California.

Westwoodilla cornuta, new species

Figures 27, 28

Description of female. — Rostrocephalon long, not strongly vaulted above, no distinct minute rostrum appended, anterior end of head slightly downturned and armed with 2 small setae, eyes apically located in distal half of rostrocephalon, small, eosin in color, anterolateral cephalic lobe sharp, symmetrical; article 1 of antenna 1 stout, produced dorsodistally into long, acute cusp, article 2 equal to 1, article 3 about 60 percent as long as article 2; antenna 1 reaching nearly to end of peduncular article 5 of antenna 2, the latter as long as head and pereon together, article 5 varying from 0 percent to 33 percent longer than article 4, flagellum as long as peduncle; epistome broadly and subacutely produced forward; upper lip broader than in *W. caecula* (in Sars, 1895: pl. 115) mandibular incisor simple, blunt, both sides with lacinia mobilis and 3 spines, molar short, very broad, blunt, flat, nearly smooth, bearing single short stout seta either simple or irregularly inflated in animals about to molt; palp article 2 proximally expanded and densely armed with stout setae; lower lip with rather narrow but curled mandibular lobes; palp article 2 of maxilla 1 broad, distally expanding; outer lobe of maxilla 2 narrower than inner lobe; inner plates of maxilliped much narrower than in other species of *Westwoodilla;* all anterior coxae with posteromedial spine, coxa 4 narrow for the genus, coxa 1 very broadly expanded; gnathopods small, scarcely subchelate, sixth articles narrow, fifth articles lacking posterior lobes (slightly better developed in gnathopod 1 of young specimens), gnathopod 2 longer and more slender than gnathopod 1; telson apically truncate, with slight lateral notches; third pleonal epimeron strongly setose ventrally and posteriorly (poorly in juveniles 3.0 mm), epimera 1-2 ventrally setose.

Male. — Antenna 2 slightly longer than in female, article 3 of first antennal peduncle as long as article 2, both articles 2 and 3 stouter than in female.

Holotype. — USNM No. 111442, female, 4.9 mm.

Type-locality. — BLA 105, 38 m, April 28, 1962.

Relationship. — Apart from normal specific differences occurring in other taxa of the genus, this species has characters that might serve as criteria for a new subgenus: the produced epistome; the proximally expanded and very strongly spinose second article of the mandibular palp; the very broad, flat, and smooth mandibular molar; the somewhat different lower lip (fig. 27i); the distally expanding second article of the first maxillary palp; the narrower inner plates of the maxilliped and the narrower outer plates of maxilla 2.

Mandibles of Californian *Westwoodilla caecula* (also figured in Sars, 1895, but with differences noted herein that may be of specific value) are shown herein with a smaller, more projecting molar having distinct cutting cuspules and spines, plus a much larger callused area (similar to Sars, 1895; pl. 117, figure of *Bathymedon)* defining the primary cutting edge than are seen in the new species. Few mouthparts of other species of *Westwoodilla* have been figured, so comparisons are in order when taxonomists reexamine them.

Specifically, the cusp of article 1 on antenna 1 is sufficient for differentiation from other known species of *Westwoodilla.* Apparently the strongly setose pleonal epimera are unique in the genus. Coxa 4 is very narrow, coxa 3 is excavate posteriorly and the outer ramus of uropod 3 is conspicuously shorter than the inner ramus, all characters not heretofore found in *Westwoodilla.*

Records. — From 19 to 46 m, with a frequency in April of 6.0 individuals/m^2, primarily on silt and silty sand bottoms.

Family Phliantidae

Heterophlias seclusus escabrosa Barnard

Heterophlias seclusus escabrosa Barnard, 1962b; 79, fig. 5.

Record. — Rocky intertidal of Vermilion Sea Field Station.

Distribution. — The nominate subspecies occurs in the Dry Tortugas Islands off Florida (Shoemaker, 1933b: 250-252, figs. 4, 5). The subspecies *escabrosa* occurs in the eastern Pacific Ocean in southern California, intertidal to about 16 m.

Family Phoxocephalidae

Heterophoxus oculatus (Holmes)

Heterophoxus oculatus (Holmes). Barnard, 1960b: 320-324, pls. 59-61; 1964a: 242.

Most of the specimens from the October samples are either juveniles or the adult form heretofore known as *H. o. nitellus* Barnard (1960). *H. o. nitellus* Barnard (1960b) is probably a synonym of *H. o. oculatus.*

Records. — Rocky intertidal to 46 m, but rare in depths of less than 30 m; frequency in April at 30-46 m is 124 individuals/m^2, in October, 44 individuals/m^2, on silts with rare exception.

Distribution. — Puget Sound, Washington to Panamá, 13-1785 m, at 2 m in Bahía de San Quintín, Baja California.

Paraphoxus cognatus Barnard

Paraphoxus cognatus Barnard, 1960b: 233-235, pl. 24.

A specimen from Dillon Beach, California, is the first female of the species to be recorded. It is like the male except for typical dimorphic characters: medium sized eyes, short second antennae and the short inner ramus of uropod 3 which is about two thirds as long as the outer ramus. The epistomal cusp is as short as that figured by Barnard; this character plus the long fifth articles of the gnathopods continue

Figure 27. **Westwoodilla cornuta,** new species, female, 4.9 mm, BLA 105: a, head with epistome below; b, pleonal epimera 1-3 left to right; c, antenna 1; d, telson; e, f, uropods 1, 2. male, 2.9 mm, BLA 149: g, h, antennae 1 2. Female, 5.4 mm, BLA 122: i, lower lip; j, k, maxilla 1; l, maxilla 2; m, mandibular palp; n, mandibular body. Female, BLA 158: o, upper lip; p, q, diagrams of mandibles to show molars and differentiated portions of primary cutting edges. *Westwoodilla caecula* (Bate), southern California: r, s, body and portion of body of right and left mandibles showing molar and differentiated portions of primary cutting edge in contrast to *W. cornuta.*

Figure 28. **Westwoodilla cornuta,** new species, female, 4.9 mm, BLA 105: a, b, c, d, pereopods 2, 3, 4, 5 (latter reduced in size); e, coxa 3; f, g, gnathopods 1, 2; h, maxilliped.

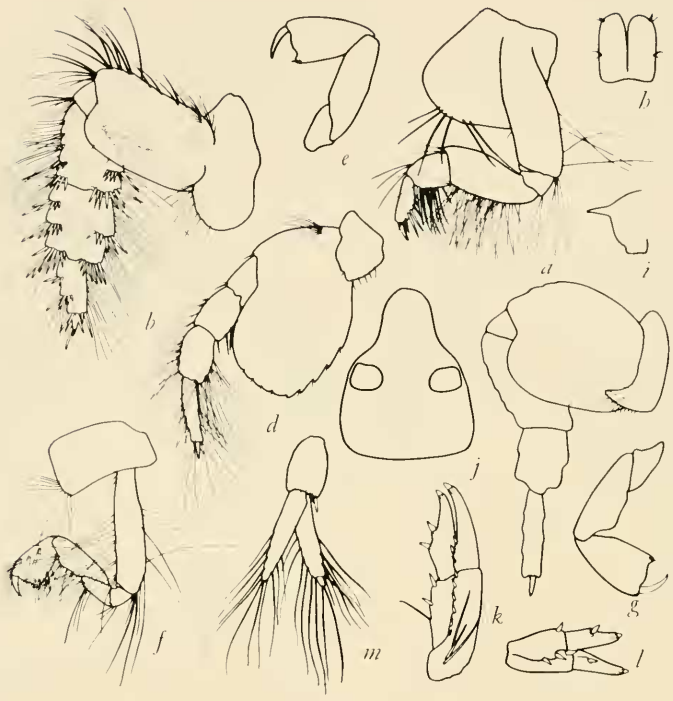

Figure 29. **Paraphoxus gemmatus,** new species, female, 5.8 mm, holotype, BLA 102: a, b, c, d, pereopods 2, 3, 4, 5, setae not drawn on pereopod 4; e, gnathopod 1; f, g, gnathopod 2; h, telson; 1, epistome; j, head, dorsal; k, l, m, uropods 1, 2, 3.

to be the principal differences separating the species from *P. similis* Barnard.
Record. — Coarse shell sand, 6 m.
Distribution. — Southern California, surface nekton to 325 m, rare. A single female of this species is in the collections of the Pacific Marine Station, Dillon Beach, near Tomales Bay, California.

Paraphoxus epistomus (Shoemaker)

Paraphoxus epistomus (Shoemaker). Barnard. 1960b: 205-209, pls. 6-8; 1964a: 243.
Paraphoxus lucubrans Barnard, 1960b: 212-218, pls. 12-14.
Record. — Gray sand, 9 m (*lucubrans* variety)
Distribution.— Western Atlantic Ocean, New Hampshire to South Carolina; eastern Pacific Ocean from Mendocino County, California to Panamá, 0-182 m.

Paraphoxus gemmatus, new species
Figure 29

Diagnosis of female. — Head with broad rostrum but constricted anterior to eyes; eyes medium in size; body broad and dorsally depressed; epistome acutely produced anteriorly; maxillipedal palp article 4 with small apical spine, one subterminal seta and one mesial seta; article 5 of gnathopods 1-2 longer than article 6, latter moderately broad and expanded distally, palm transverse; ratio of articles 5 to 6: gnathopod 1=14:11; gnathopod 2=13:11; articles 4-5 of pereopod 3 moderately expanded, narrower than article 2, article 6 shorter than 5, ratio of widths of articles 2, 4, 5, 6=52: 40: 45: 20; article 4 of pereopod 4 slightly broader than article 4 of pereopod 3, article 6 much longer than 5, ratio of widths of articles 2, 4, 5, 6=78: 45: 32: 13; article 2 of pereopod 5 broad, ratio of width to length about 9: 11, posterior edge of article 2 with 5 small, symmetrical teeth, sweep-point occurring near distal end of article 4, ventral edge broad, scarcely dipping anteriorly and slightly convex; remainder of pereopod 5 moderately stout, article 6 longer than 5; uropods stout, rami of uropod 1 shorter than peduncle, very stout, expanded proximally, strongly notched outer ramus with 3 marginal spines, inner with 2 large spines (shining like jewels), lateral margin of peduncle densely spinose, with 3 large proximal setae on lateral surface, inner margin with seta, 2 marginal spines and 1 large distal spine; uropod 2 with rami subequal to

Figure 30. **Garosyrrhoe disjuncta,** new species, female, 4.2 mm, BLA SIO-X: a, head; b, c, d, pereopods 3, 4, 5; e, f, articles 6-7 of gnathopod 2; g, h, articles 6-7 of pereopods 1, 2; i, j, articles 6-7 of gnathopod 1; k, pleonal epimera 1-3, left to right; l, dorsal ornamentation of pleonite 3; m, dorsal ornamentation of pereonite 7 and pleonites 1-2. Male, 3.0 mm: n, maxilla 1; o, inner maxillipedal plate; p, maxilliped.

peduncle, very strongly notched and stout (not fully flattened in lateral drawing), each ramus with stout spine; inner ramus of uropod 3 as long as outer ramus, both strongly setose; telson moderately broad, apices rounded, each with 1 spine and 1 setule; third pleonal epimeron like *P. epistomus* (see pl. 6 in Barnard, 1960b), but spines much stouter, gland cone similar.

Male. — With typical sexual difference in its large eyes, strongly setose uropod 3, long second antennae and the more broadly rounded, asymmetrical third pleonal epimeron. Uropod 1 with only 2 spines on each ramus, neither expanded as much as in female. Epistomal process well-developed.

Holotype. — USNM No. 111499, ovigerous female, 5.8 mm.

Type-locality. — BLA 102, 6 m, October 31, 1963.

Relationship. — This species is similar to *Paraphoxus heterocuspidatus* Barnard (1960b) but differs by the presence of an acute, anterior epistomal cusp, the even teeth of pereopod 5 (some specimens of *P. heterocuspidatus* also show this), the presence of a marginal spine on both rami of uropod 3 and more than one on each ramus of uropod 1, with the rami much stouter and more strongly notched than in *P. heterocuspidatus*.

A specimen from BLA-9, provisionally referred to this species, is a male with no epistomal process and a fifth pereopod more like that of *P. lucubrans* Barnard (1960b) than that of the female of *P. gemmatus*; uropod 1 and all other characters except pereopod 5 are like those of *P. heterocuspidatus*.

Records. — Ranging in depth from 2 to 9 m.

Paraphoxus spinosus Holmes

Paraphoxus spinosus Holmes 1905: 477-478. Kunkel, 1918: 76-78, fig. 13. Shoemaker, 1925: 26-27. Barnard, 1959a: 18; 1960b: 243-249, pls. 29, 31; 1961: 178; 1964b: 105.

These specimens are like those from Newport Bay, California figured by Barnard (1960b).

Records. — Rocky intertidal to 24 m on coarse substrate.

Distribution. — Western Atlantic Ocean; eastern Pacific Ocean from Puget Sound to the Gulf of California, 0-37 m, rarely to 73 m.

Paraphoxus tridentatus (Barnard)

Pontharpinia tridentata Barnard, 1954c: 4-6, pls. 4, 5.

Paraphoxus tridentatus Barnard, 1960b: 261-262.

Paraphoxus tridentatus pallidus Barnard, 1960b: 262-263, pls. 38, 39.

These specimens are like those of *P. t. pallidus* figured by Barnard (1960b) but the rami of uropod 2 and the outer ramus of uropod 1 each lack the single spine characteristic of *P. t. pallidus*. The inner ramus of female uropod 3 is as long as article 1 of the outer ramus, whereas in *P. t. pallidus* the inner ramus is half as long as article 1 of the outer ramus. Gnathopods 1 and 2 are slightly stouter than in *P. t. pallidus*, more like those of the open-sea Oregonian form figured by Barnard (1954c).

Records. — Ranging in depth from 19 to 38 m.

Distribution. — Puget Sound, Washington to just north of Pt. Conception, California, shallow water and intertidal.

Family Pleustidae

Parapleustes commensalis Shoemaker

Parapleustes commensalis Shoemaker, 1952: 231-232, fig. 83.

This specimen, 4.0 mm long, corresponds to Shoemaker's figures and description, except that it is morphologically better-developed, even though it is 1.5 mm shorter. The inner plate of the maxilliped has 7 of the small blunt spines (not 4), the lateral margin of mandibular palp article 3 has 3 spines (not 2) and the gnathopodal palms have 3 sets (not 2) of double spines on the defining margins. Pleonal epimeron 3 is more strongly convex posteriorly than it is in Shoemaker's material.

Record. — Dredge, west side of bay at station 40, 9 m.

Distribution. — Santa Barbara, California, from pleopods of a spiny lobster.

Family Podoceridae

Podocerus brasiliensis (Dana)

Podocerus brasiliensis (Dana). Barnard, 1962a: 67, fig. 30; 1964a: 245-246.

Records. — Rocky intertidal to 24 m on coarse substrate.

Distribution. — Cosmopolitan in tropical and warm-temperate, shallow seas.

Podocerus fulanus Barnard

Podocerus sp., Barnard, 1959a: 40, pl. 14.

Podocerus fulanus Barnard, 1962a: 69.

Considerable variation occurs in the height of pereonal and pleonal dorsal teeth with large adults having these teeth projecting much more strongly than in Barnard's (1959a) figures. Large males have the palm of gnathopod 1 strongly concave.

Records. — Rocky intertidal to 42 m.

Distribution. — Newport Bay, California, about 0-2 m.

Family Synopiidae

Garosyrrhoe disjuncta, new species

Figure 30

Diagnosis. — Posterodorsal edges of pereonite 7 and pleonites 1-2 each with pair of blunt dorsolateral teeth,

each with medial hook and separated by shallow excavation, these teeth less prominent on pleonite 3, dorsolateral edges of these segments also with small hooked teeth; teeth of posterior edge of third pleonal epimeron much stronger than in *G. bigarra* (Barnard, 1962b); rostrum well-defined, acute, strongly projecting ventrally; article 5 of pereopod 3 about 80 percent as long as article 4, poorly setose posteriorly, article 2 bulging anterodistally.

Holotype. — USNM No. 111467, female-like, 3.0 mm.

Type-locality. — BLA SIO-X, Piedras Ahogadas, 0.5 mile south of Isla Ventana, SCUBA sample of shell fragments, pebbles, 24 m, April 22, 1962, Dr. Carl L. Hubbs and party, coll.

Relationship. — This species differs from *Garosyrrhoe bigarra* (Barnard, 1962b) by the longer, more acute rostrum, the double dorsal teeth of the body segments, the stronger teeth of the third pleonal epimeron and the shorter fifth article of pereopod 3. Pereopods 4 and 5 of *G. bigarra* are not known. Spination of articles 6-7 of pereopods 1-2 differs between the two appendages (see figures). The dorsal surface of the head bears a crest and the ventral surface of the inner maxillipedal plate bears a hooked spine. All the specimens are either females or lack brood-plates and have short second antennae and are therefore female-like.

Records. — Rocky intertidal to 24 m, usually on coarse substrate.

ACKNOWLEDGEMENTS

This report was supported in part by a National Science Foundation Grant (G-20909) and by the Beaudette Foundation of California. Mr. Richard F. Dwyer, of Los Angeles, California, has generously assisted with funds for publication. Miss Jacqueline M. Hampton prepared most of the plates. I gratefully acknowledge the assistance of numerous other persons listed by Barnard and Grady (1968). Mr. Scott Gray and Dr. Joel W. Hedgpeth, then of Pacific Marine Station, Dillon Beach, California, kindly loaned me a specimen of *Paraphoxus cognatus* for inclusion in this study. Mrs. Carolyn B. Gast prepared the charts.

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Revised Manuscript Accepted for Publication 22 October 1968

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APPENDIX

Derivation of New Systematic Names

periculosus, L., perilous
susurrator, L., mutterer
coyoa, Sp., coyote
conductor, L., employer
Rildardanus tros; Ril, anagram from Lirondo, Sp., pure; Dardanus, mythical ancestor of royal family of Troy; Tros, grandson of Dardanus and son of Ericthonius.
nasa, L., fish-trap
luculenta, L., bright
falciformis, L., sickle-shaped, likeness
visendus L., gerundive of viso, contemplate
Meximaera diffidentia; Meximaera, a Mexican Maera; diffidentia, L., diffidence
tonichi, Mexicanization of L., tono, thunder; nidus, nest
marcinabrio, L., marcidus, perishable; abrir, Sp., to open
lazaris, Sp., lazar, to catch with lasso
cornuta, L., horn
gemmatus, L., bearing jewels
disjuncta, L., separation